STAFF REPORT
Downtown Bellingham Air Toxics Screening Project
1995-1999

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Introduction

This report describes air toxics monitoring activities conducted by the Northwest Air Pollution Authority (NWAPA) in Bellingham, Washington. The monitoring project involved five different sampling locations and 107 sampling days between July 1995 and August 1999. Seventy-three organic chemicals were targeted during the project. Many of the chemicals targeted are considered to be "air toxics," a term among air quality managers for a wide group of chemicals found in air that have a notable potential to cause health problems ranging from mild irritation to more serious health effects such as cancer and lung disease. The main objective of the monitoring project was to provide exploratory (screening) data regarding levels of these airborne contaminants in the downtown area. A second purpose was to provide urban air quality data to the Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards to support implementation of the Federal Clean Air Act. Initial monitoring was sponsored by EPA Region X and the EPA Urban Air Toxics Monitoring Program (UAMTP); subsequent monitoring was managed by the Northwest Air Pollution Authority (NWAPA) with partial federal funding.

This report summarizes the main findings of the air toxics screening project and provides all measurement data and all relevant sampling methodology information. Results from each sampling site are addressed with respect to methodology, available quality assurance data, health screening criteria, and common ambient concentrations elsewhere. While the basic approach was the same for all the samples, there was, in some cases, profound variation in methodology. The precision and accuracy of measurement also varied and some chemicals were not always measurable because of analytical limitations. These factors add complexity to the interpretation of the results. Assumptions and limitations associated with this study are described and we urge very careful attention to those elements.

Two major groups of air contaminants were sampled: volatile organic compounds (VOC), and carbonyl-containing pollutants (carbonyls). Carbonyl-containing compounds have the carbon-oxygen double bond chemical group and include substances such as acetone and formaldehyde. VOCs are essentially carbon containing compounds that evaporate at normal temperatures and include substances such as benzene, chloroform, and xylene. This study provides the first known long-term measurement of these chemicals in the outdoor air in Bellingham. Other chemicals such as polynuclear aromatic hydrocarbons (eg. benzo-a-pyrene), pesticides, dioxins (e.g. TCDD) and metals, such as lead or mercury, were not measured during this study.

The chemicals sampled during this project are not routinely monitored in Washington State, although several special projects have provided limited data for locations in Vancouver (WA) and in the Seattle-Tacoma area. The EPA has sponsored air toxics monitoring at other U.S. locations and a number of states have their own air toxics monitoring programs (e.g. California, Vermont, and Minnesota). Concentration levels of the subject chemicals found in other air toxics monitoring programs, including indoor studies, are provided in this report. Comparisons between sites can be very complicated because there are no uniform criteria for sampler siting and the methods of sampling and analysis vary. The location of the sampler in relation to traffic and other sources of air pollution has a large influence on measurements and whether sites can be meaningfully compared. An inventory of air toxics emission estimates is provided (Appendix D).

One of the goals of this project was to evaluate air concentrations for potential public health impacts. This evaluation was done by comparing our monitored concentrations to conservative health screening benchmarks. Note that this analysis is a preliminary comparison between air measurements that have limitations on study design, and screening benchmark concentrations that are highly protective and that generally do not represent significant health impact. The purpose of the comparisons is to screen out chemicals that are of such low exposure potential that further health analysis is not warranted for them. Chemicals that are measured at levels exceeding these benchmarks must be evaluated further to determine their potential for affecting health adversely. Their identification simply suggests that further analysis is appropriate.

This report is structured as follows: 1) General project design elements are addressed, such as sampling and analysis protocols, and the data review approach; 2) Study results from each sample site are profiled and analyzed; and, 3) Conclusions based on our interpretations of the monitoring results and other factors are provided.

The data analysis approach taken in this report is a multi-step process focused on identifying, among the chemicals monitored, if airborne levels may present an unusual community health issue. The data analysis is structured as follows: 1) Chemicals found infrequently (below detection limits on more than 25% of the sampling days) are "culled" and not reviewed further; 2) Chemical concentration data that are unreliable (excessive variability or poor accuracy) are flagged; 3) Chemical concentrations are compared to conservative health screening benchmarks; and, 4) Concentrations greater than the health screening levels are compared to typical levels found in other places. This approach identifies flawed data and potential health issues, and portrays Bellingham air quality in the context of other urban locations. Because this analysis is intended to screen the data, and to provide approximations, no statistical significance testing was performed. This lack of significance testing is a major limitation that must be considered when drawing conclusions from the results.

As detailed below, several conclusions were reached from our basic review of the monitoring results. The majority of the chemicals monitored were at levels below health screening benchmarks. But, of the chemicals addressed, nine were found at levels above the health screening benchmarks at one or more sampling locations. Further review of these nine chemicals in the context of data quality, typical ambient levels elsewhere, and regulatory efforts yielded our recommendations for agency action. The recommendations ranged from no action, to additional monitoring and investigation, and to referral of the findings to health department experts for additional review.

Project Design & Methods Summary

- **Sampling Sites**

Monitoring was conducted at five different sampling sites in Bellingham, Washington (Lat. 48°45' N - Long. 122°30'W - 1996 pop. 59,840). Methodology and sampling regimen at each site are described in detail below. Sampling locations are indicated graphically in Figure 1. The sites are identified as follows:

Site Name	Approximate Location	Sampling Period	VOC samples	Carbonyl samples
Cornwall	Intersection of Cornwall Avenue and Magnolia Street (104 W. Magnolia)	8/19/95-10/30/96	*31*	*30*
Grab Sample (1 hr.)	Downtown sidewalks during evening commute	9/8/97	*1*	*0*
Railroad	1400 Block Railroad Ave (1421 Railroad Ave.)	8/18/97-10/16/97	*7*	*6*
Bay	Bay Street Village-near intersection of Bay Street and E. Chestnut (301 W. Holly)	11/12/97-8/22/99	*39*	*35*
Yew (2 sites)	Bellingham Fire Department, Station 4, 2306 Yew St.	9/23/98-5/29/99	*9*	*9*
	Yew St. Mini-Mall 2420 Yew St.	6/10/99-8/22/99	*6*	*7*

All sampling at Cornwall and Yew, and most samples at Bay were scheduled *a priori* and are random with respect to meteorology. The 9/8/97 Grab Sample and all sampling at the Railroad site were specifically targeted to observed periods of stagnant meteorological conditions (possible air pollution episodes). This subjective (targeted) approach was taken in an attempt to rapidly evaluate approximate concentrations. The Cornwall site is highly influenced by adjacent motor vehicle emissions, and poor dispersion conditions in the area likely create higher pollutant levels. This site was chosen to approximate a "worst-case" downtown locality. Site selection, in general, was influenced by logistical needs such as availability of shelter, electricity, access, and security.

- **Sampling Protocols (General)**

The following general sampling protocol was used. Further details regarding specific samples are described below for each site, and are annotated in the data spreadsheet (Appendix-A). The sampling and analysis protocols followed EPA Method TO-11 or TO-11A for carbonyls and EPA Method TO-14 or TO-14A for volatile organic compounds. The sampling approach followed or closely approximated the approach taken by EPA's Urban Air Toxics Monitoring Program.

Carbonyl samples were taken with an electronically controlled timer and pump apparatus used to draw outside air through stainless steel tubing. Ozone, which degrades the sample, was scrubbed from the incoming airflow by a thermal reactor (ozone scrubbing not performed 8/18/97 & 9/2/97 at Railroad). A plastic cartridge containing silica laden with dinitrophenylhydrazine (DNPH) reagent was used to trap carbonyl-containing compounds. Sample volume was estimated by the average of initial and final flow rates measured with calibrated rotameters.

VOC samples were taken via two different approaches. Both approaches used passivated (coated to reduce decay of the sample) stainless steel sample canisters provided by the laboratory. Canister

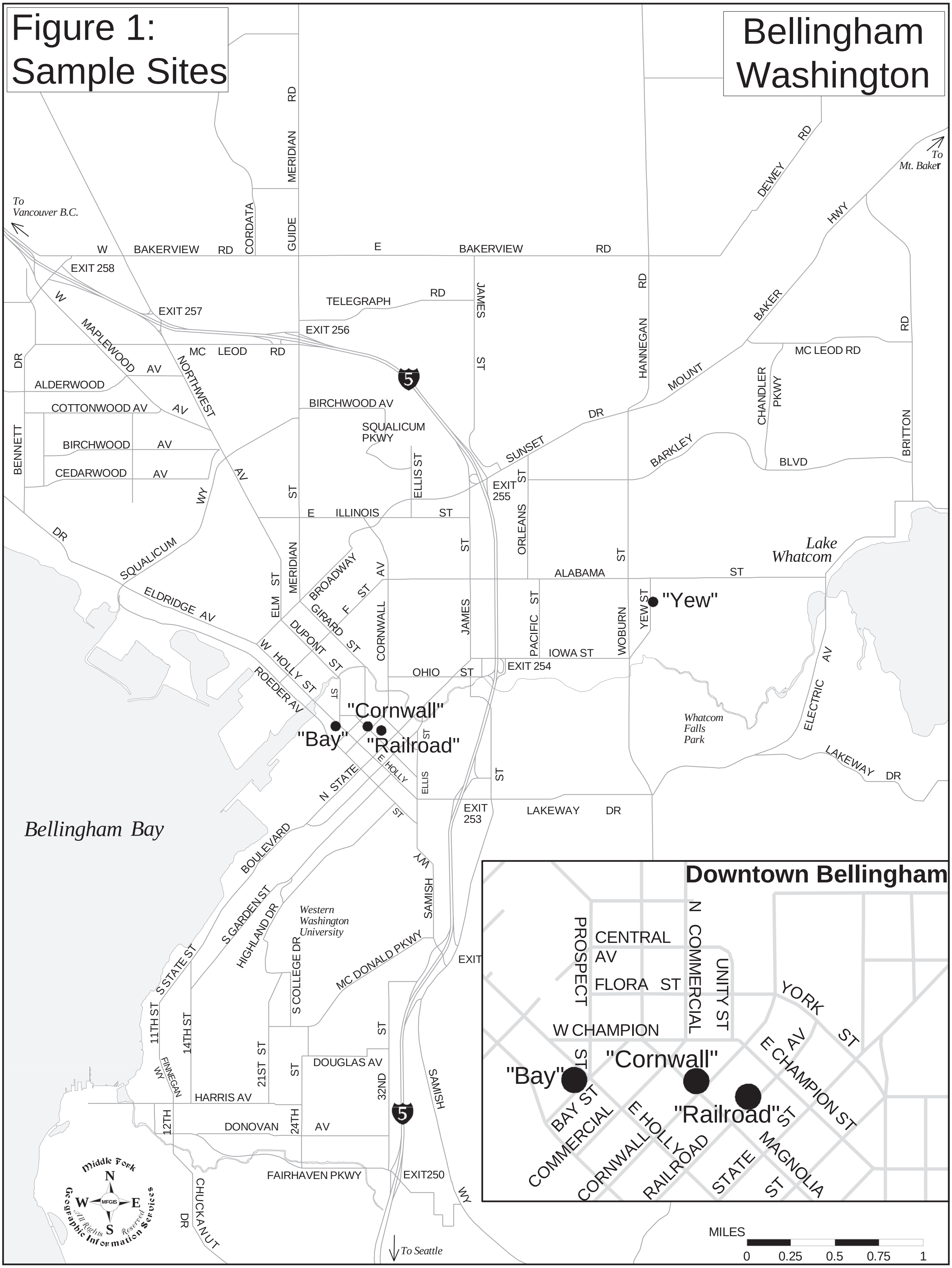

Figure 1: Sample Sites

preparation followed EPA methods. In most cases an electronically controlled timer and pump apparatus was used to draw outside air through stainless steel tubing. Sample airflow was filtered through a clean 7-micron metal filter and captured in a six-liter passivated steel vacuum canister. Sample lines were automatically purged for 15 minutes immediately prior to sample collection. The Grab Sample, some Yew samples and duplicates at Bay were taken via a manually activated mechanical flow controller that metered a relatively constant flow into the vacuum canister. Manual sampling required the operator to turn the sampler valve on and off; no pump or timer was used to collect the sample. A mechanical flow controller with a programmed automatic valve actuator became available at the end of the project and was used to collect duplicate samples at Yew on 8/22/99. Initial and final canister pressure was recorded. Sampling interval duration varied in some cases as indicated in Appendix-A. These differing sample collection approaches (automatic vs. manual sampling) are essentially equivalent with respect to study design, but the automatic samplers are more complex and are more prone to leakage and contamination. The manual samplers yield higher detection limits than do the automatic samplers.

Over the course of the project some variation in sampling occurred. For example, manual VOC sampling at Yew produced higher detection limits than provided by subatmospheric samples collected via automatic samplers at Bay and Railroad. And, as mentioned above, some samples were specifically targeted to stagnant atmospheric conditions. Procedural and equipment differences between sampling sites are further described below and in annotations to the data sheet in Appendix A.

- **Analytical Protocols**

All canister and carbonyl samples were analyzed according to guidelines specified in EPA Compendium Methods. The list of analytes and laboratory utilization are presented with data in Appendix A. The Eastern Research Group, Inc. laboratory in Morrisville, NC, (ERG) analyzed samples from Cornwall in accordance with EPA Method TO-14, "Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Summa® Passivated Canister Sampling and Gas Chromatographic Analysis" (USEPA, 1984a). Air Toxics Ltd., Folsom, CA, (ATL) performed all other VOC analyses in accordance with EPA method TO-14, TO-14A, or TO-15 (TO-14 A and TO-15 are updated versions of the TO-14 protocol). Preconcentrators and mass spectrometer detectors were used in most cases to attain detection limits in the 0.1 parts per billion (ppb) range for most compounds.

ERG analyzed all carbonyl samples except for two samples from Railroad according to guidelines specified in Compendium Method TO-11 or TO-11A, "Method for the Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC)" (USEPA, 1984b). Air Toxics Ltd. performed TO-11 analysis of two carbonyl samples from the Railroad site. Acetone was measured both by TO-11 and by TO-14A performed by ATL. Only the TO-11 acetone results are summarized.

- **Quality Assurance/Quality Control**

As with all sampling data, the chemical concentration data presented in this report are estimates based on measurements that are subject to errors and random variability. Estimates that might be far from actual concentrations or that are not reproducible make interpretation difficult. The accuracy and reproducibility (precision) of the estimates are influenced by the procedures of sampling, transport, storage, analysis, data handling, and by inherent variability. Adherence to standard procedures helps to minimize variability and improve accuracy. Duplicate, blank, and spiked samples were analyzed to evaluate errors. Over the course of the project, precision and accuracy ranged from very good, to very poor, to unknown. Significant focus is given to data quality in the Monitoring Results section below.

Criteria were established to evaluate the data in the context of sampling and analytical errors. Data resulting from sampling that did not conform to standard procedures are noted. Samples that suffered from poor accuracy or lack of precision are also noted and excluded from analysis. Quality control data are provided in Appendix B. Relative percent difference (RPD) was used to evaluate the spread between measurements. RPD is calculated as:

$$RPD = |x-y| / \text{avg. } x, y \ (100)$$

One-half the detection limit was assigned to below detection limit data used in the duplicate comparisons. The quality control analysis presented in this report went as follows:

1. Each sample day was reviewed for adherence to standard operating procedures (sampling, transport & analysis).
2. Notation is made if there was excessive disagreement between duplicates (>50% relative percent difference (RPD)).
3. Notation is made if there was excessive disagreement between spiked sample and source (>25% RPD).
4. Notation is made if there was excessive bias evident from zero-air blanks (>2X laboratory detection limit).

Discussions with other air agencies and with the EPA indicate that the above quality control evaluation criteria are reasonable for this type of project.

- **Data Analysis**

The complete measured concentration data set is included in Appendix A. Levels reported in Appendix A are in parts per billion by volume (ppbv) but other concentration data in this report are expressed as micrograms per cubic meter ($\mu g/m^3$). Ambient air parts per billion are converted to micrograms per cubic meter as follows:

(ppbv) x molecular weight ÷ 24.451 = $\mu g/m^3$ (assume 25°C and 1 atmosphere pressure).

Geometric mean is provided as a summary statistic for the central tendency of the data. Geometric mean is used, rather than arithmetic mean, because ambient toxics monitoring data do not typically fit a normal distribution; a log-normal distribution is more typical. Geometric mean is considered to be more representative of central tendency when the data set fits a log-normal distribution (McBean and Rovers, 1998).

Analytical results vary widely and accuracy declines at concentrations near the minimum limit of detection. For this reason the analytical performance test specifies the minimum concentration that can be detected with an acceptable amount of variability. The analytical method detection limits reported by the laboratories are provided in the data tables in Appendix A. Results below the analytical detection limit were reported by the laboratories as "non-detect."

Non-detects complicate data analysis in a set of data that includes detected concentrations. There are a number of conventions that are used to deal with chemicals that are reported to be below the limit where the number reported can be clearly known to be accurate. One convention is to use zero for concentrations below that limit; another is to take an actual reading, although it is not known whether that number is real or accurate; still another is to assign a value of the detection limit or one-half the detection limit. Each of these conventions can affect the central tendency statistic of the data, (depending on the relative number of non-detects in a data set), yet none of the conventions make the averaged data more certain. If there are very few non-detects, the central tendency, (and standard deviation statistic), will not be affected very much by any of the conventions. Assigning zero lowers the central tendency the most, assigning the detection limit raises central tendency calculations. Deleting the non-detect datum raises the central tendency the most; this is the approach taken in this report. For chemicals detected on more than 25% of the sampling days, summary statistics are based only on the number of days on which the chemical was detected. This method skews the sample mean to be higher than if the total number of measurement days were used in the calculation. If there are a large number of non-detects in a data set, it is not valid to calculate central tendency of that data set. Chemicals detected on less than 25% of the sampling days are excluded from detailed review.

- **Health-Based Screening**

To identify chemicals that may be relevant to community health, results from the monitoring project are compared to health screening benchmarks. Health screening benchmarks are chemical concentrations considered to be safe or insignificant to public health. The comparison presented here generally follows the procedure used by Caldwell, et al. (1998) to analyze hazardous air pollutants modeled in EPA's Cumulative Exposure Project. This screening approach is simplistic and does not consider populations, indoor air quality, activity patterns, toxicity interactions, or ecological toxicity. But it is a common approach to prioritizing chemicals and localities. There are currently no federal or state regulatory ambient air quality standards for the subject chemicals.

Average or peak measured concentrations from the monitoring project are compared to benchmarks to sort out chemicals that may warrant additional investigation from chemicals that are likely to be insignificant with respect to public health. Benchmarks in the form of "Acceptable Source Impact Levels" from Chapter 173-460 Washington Administrative Code were used for this purpose. Acceptable Source Impact Levels (ASILs) are health-based regulatory screening thresholds used to evaluate emissions from new or modified sources of toxic air contaminants. Chapter 173-460 Washington Administrative Code and the ASILs have no enforceable regulatory relation to the results of this study or to existing sources in the area. Despite this lack of regulatory pertinence, the levels are convenient health-based tools for screening air quality data. The ASILs have been reviewed by toxicologists at the Washington State Department of Ecology Air Quality Program (Ecology) and the Washington State Department of Health. Levels at or below the ASIL will most likely pose an insignificant hazard. Levels above the ASIL indicate that further analysis might be appropriate. It is important to note that a concentration greater than the ASIL does not necessarily mean that there is an adverse public health hazard.

Lack of toxicity data prevented Ecology from establishing ASILs for many chemicals. For this reason there is not an ASIL for every chemical that was monitored. This report provides no health screening for chemicals that do not have ASILs. Furthermore, exhaustive screening is not possible when the analytical detection limit is above the ASIL.

Acceptable Source Impact Levels are noted as “A” if there is evidence that they may cause cancer in humans. Chemicals with ASILs listed as “B” are considered noncarcinogenic or unclassified with respect to carcinogenicity (these designations are different from EPA's weight of evidence codes).

Class A-ASILs

The class A-ASILs are generally set at the concentration representing the statistical upper bound estimate of a one in a million excess probability of contracting cancer over a lifetime of exposure. In other words, exposure to the listed concentration over a 70-year lifetime is estimated to cause the probability of contracting cancer to increase by one in a million (over-and-above the cancer risk from other causes). This is risk due only to a specific chemical exposure, and is additional to the background risk of cancer that is prevalent in the general population. The one in a million cancer risk level is a common threshold for identifying chemical exposures that warrant concern and further review. The potency of a carcinogenic chemical is determined from animal testing or occupational or other epidemiological studies and extrapolations of the data to account for differences in species, dose, exposure level, and exposure pathway.

The class A-ASILs are intended to be used to screen annual average ambient levels. Actual average annual concentrations are unknown so the averages of the sampled concentrations are used here as estimates of average annual concentrations.

Class B ASILs

Chemicals with ASILs listed as “B” are considered noncarcinogenic or unclassified with respect to carcinogenicity. Class B-ASILs are typically set at the highest levels of exposure found via toxicity testing and epidemiological studies to be safe (without adverse biological effects) over long term exposures. Non-cancer toxicity includes many possible effects ranging from reversible respiratory tract irritation to birth defects. Ambient concentrations at the level of a class B-ASIL would likely be safe over a lifetime of daily exposure.

According to the Department of Ecology, Class B-ASILs are properly compared to peak 24 hour average concentrations. Since each monitoring period was 24 hours long, the concentration data listed in Appendix A represents 24-hour average concentrations (with some exceptions-see Appendix A for sampling intervals).

- **Concentration Comparisons**

It is informative to compare the findings from the Bellingham study to concentrations measured at other locations. These types of comparisons are complicated, however, because of differences in methodology and monitor siting. Different analysis methods and different approaches to dealing with non-detect data and averaging will complicate comparisons. Siting is an issue because outdoor concentrations of air toxics are profoundly influenced by the proximity of the sampler to strong emission sources. These factors must be considered when comparing locations. Most ambient toxics monitoring projects aim to sample air that is reflective of a medium or large-scale geographic area. The Cornwall site was severely influenced by close proximity to vehicle traffic emissions and poor atmospheric dispersion. Monitoring data from Cornwall most likely reflects a small geographic area rather than the greater residential areas of Bellingham.

Chemical information sheets prepared by the California Air Resources Board (CARB) were used extensively in this report as a source of information on ambient (outdoor) concentrations, and the concentrations inside residences. The information sheets also provided information on potential sources of chemical emissions. The sheets can be accessed via the internet at: http://www.arb.ca.gov/toxics/tac/tac.htm.

Ambient data were obtained from the Greater Vancouver Regional District (GVRD). The GVRD operates air monitors at many locations in the Lower Fraser Valley, including the City of Vancouver, British Columbia. The GVRD and CARB ambient data reflect average values calculated from measurements at a whole network of monitors. Other ambient and indoor data were gathered from published literature, EPA reports and directly from EPA experts.

Monitoring Results

Data Quality Assessment Results

This section summarizes important data quality issues that strongly influence interpretation of the monitoring results. Quality control and quality assurance procedures of the project are described above. While quality control data are not available for every segment of the project, the results from one segment may, to some extent, be applied to other segments. Quality control data are provided in Appendix B.

The variability of our carbonyl measurements (combined sampling and analysis precision) was evaluated through the use of duplicate samples. Contamination of the carbonyl sampling system was evaluated through the use of blank samples. No carbonyl data were rejected via the quality screening criteria stated above. However, all acrolein results are suspect because of a flaw in the EPA method. EPA issued a memo indicating that method TO-11A (or TO-11) is not applicable to acrolein (EPA, 1999 *Addendum to Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air-Second Edition*)). Eastern Research Group indicated that the addendum was issued because acrolein is unstable after collection (Tim Hanley, ERG. personal. conversation. 11/22/99). Acrolein is flagged as suspect in all of the data summaries. In addition, ERG noted in their 1995 UATMP report to EPA that there was poor spike recovery performance for acetaldehyde in a quality control laboratory test (EPA, 1997). However, the ERG laboratory indicated that the results from all carbonyl duplicates and blanks from sampling in Bellingham were within the quality control criteria of the UATMP.

Calibration gas was passed through the Bay VOC sampler to generate a VOC spike sample. The calibration gas did not contain all of the chemicals measured by the analytical method so the evaluation is incomplete. The available spike-recovery data indicate that chloromethane, vinyl chloride, bromomethane, chloroethane, 1,2,4-trichlorobenzene and hexachlorobutadiene all yielded relative percent differences (RPDs) greater than 25%. The monitoring results for these chemicals are flagged in all of the data summaries.

Blank VOC samples were simulated by passing ultra high purity nitrogen through the VOC samplers used at the Railroad, Bay and Yew sites (the same sampler was used at Railroad and Bay). No blanks were evaluated for the Cornwall sampler. No contamination was found at levels greater than 2X the detection limit in a blank that was performed on a mechanical sampler. The chemicals found in blank samples at levels greater than two times the detection limits are shown in Table 1, below.

Table 1
Blank Sample Results Summary

	Bay Automatic Sampler (3 blanks)	Yew Automatic Sampler (2 blanks)	Mechanical Sampler (1 blank)
Chloromethane	X	X	BDL
Methylene chloride	X	X	BDL
Benzene	X	X	BDL
Toluene	X	BDL	BDL
1,4-dioxane	X	X	BDL
Ethanol	X	X	BDL
Acetone	X	X	BDL

Table 1. Chemicals found in at least one blank sample at levels greater than 2X the detection limit. The Bay sampler was also used at Railroad. BDL = below detection limits.

Ethanol and 1,4-dioxane exhibited severe contamination in some blanks, but were below the detection limit in other blanks. Acetone levels were extremely high in all of the VOC blank samples. The chemicals listed in Table 1 are flagged as uncertain in the Railroad, Bay and Yew data summaries. The VOC sampler used at Cornwall was not tested in the field, but was certified to be clean according to a similar approach in the laboratory before delivery of the sampler to the site.

All VOC duplicate samples at Cornwall were within the 25% relative percent difference screening criteria except for one duplicate involving 1,1,2,2-tetrachloroethane. No data from Cornwall were flagged on the basis of poor duplicate results. Duplicate results for the Bay and Yew automatic samplers indicated a number of chemicals that consistently suffered poor precision. These chemicals are flagged in the Railroad, Bay and Yew data summaries as uncertain.

CORNWALL AVENUE

Cornwall-Site Characteristics

The Cornwall site was located very close to a main downtown intersection controlled by signal lights. The streets also host parking. The site was in the direct vicinity of typical urban air emission sources, e.g. automobiles and trucks, dry cleaning, building maintenance, spray coating, and restaurants. The site was situated about one-half mile northeast from a sulfite pulp/paper mill, an alcohol plant, a natural gas and distillate fuel-fired cogeneration plant, and a chlor-alkali chlorine manufacturing plant. The sample intake was located 3 feet from the side of a three-story building, 12 feet above the sidewalk and about 20 feet from the intersection of Cornwall Avenue and Magnolia Street (Figure 1). The site is very likely heavily impacted by traffic emissions. Industrial and light commercial emissions also influence the site. Dispersion can be poor because of the canyon effect and buildings downtown.

Cornwall-Sampling and Analysis Regimen

Air samples were collected approximately every 12 days between July 16, 1995 and October 30, 1996 without regard for atmospheric conditions. Samples were taken continuously for 24 consecutive hours (starting at midnight standard time). A common pump/timer apparatus gathered both the carbonyl and VOC samples. The sample rate was set to leave a residual vacuum in the canister at the end of the sampling period. All sampling apparatus were provided by the Environmental Protection Agency

(EPA) and were designed for EPA's Urban Air Toxics Monitoring Program (UATMP). All sample analyses were performed by EPA's contract laboratory in Research Triangle Park, North Carolina (Eastern Research Group (ERG) (formerly Radian Corp.)).

Cornwall-Results Summary

A number of chemicals were rarely or never detected. Chemicals detected on less than 25% of the sampling days are listed in Appendix C, and are not reviewed further in this report. Results for the chemicals detected on more than 25% of the sampling days are indicated in Table 2, below. The Cornwall sampling regimen did not produce spiked or blank VOC samples, so no direct evaluation of contamination or sample recovery is possible. Duplicate VOC samples were produced by splitting the flow from one sampler into two canisters. Duplicate variability was good and no data were rejected due to poor agreement between duplicates. There were no accuracy assessments performed in the field during the Cornwall sampling phase. Quality control data are provided in Appendix B. As indicated in Table 2, there were seven chemicals found at concentrations greater than their respective ASIL health screening thresholds.

RAILROAD AVENUE

Railroad-Site Characteristics

The Railroad Avenue site was located about one city block from the Cornwall site (Figure 1). Railroad Avenue hosts city traffic and parking and the sampler was directly across the street from the downtown city transit station. The same emission sources listed for the Cornwall site were also proximate to the Railroad site, but the Railroad site was not directly adjacent to an intersection and was less influenced by tall buildings. The sample intake was located on a one-story building rooftop approximately 20 feet above street level and 20 feet lateral distance from the street edge. The intake point was approximately three feet above the surface of the flat rubber-membrane rooftop.

Railroad-Sampling and Analysis Regimen

All of the samples at the Railroad Avenue site were targeted to attempt capture of stagnant atmospheric conditions. This targeted approach disallows interpretation of the data to represent long-term (e.g. annual) average concentrations.

VOC samples were collected via a flow controlled pump/timer apparatus manufactured by Scientific Instrumentation Specialists (SIS, Moscow, ID). VOC sampling canisters were provided and analyzed by Air Toxics Ltd. (ATL), Folsom, California.

Carbonyl cartridges and analytical services were initially procured from Air Toxics Ltd. (8/18/97 & 9/2/97). These carbonyl samples were gathered from the purge flow circuit of the SIS sampler and were not scrubbed of ozone. Carbonyl data from these sampling days are provided here but may be suspect due to this procedural difference. Acrolein was not measured on the first two carbonyl sampling days (8/18/97 & 9/2/97). The Railroad sampling regimen did not produce duplicates, spiked or blank VOC samples, so no direct evaluation of precision, contamination or sample recovery is possible. Chemicals with notable potential error issues based on quality control at the Bay and Yew sites are flagged in the Railroad results summary table.

Railroad-Results Summary

The chemicals detected on less than 25% of the sampling days at Railroad are listed in Appendix C. These chemicals are not reviewed further in this report. Results for the chemicals detected on more than 25% of the sampling days are indicated in Table 3. Class-A ASIL chemicals are not flagged in the Railroad results summary because sampling at the site was targeted so the results do not reflect long-term averages appropriate for this comparison.

Table 2
Results Summary
Cornwall Site

	Frequency of detection	Minimum value	Maximum value	Geometric mean	ASIL
Units	percent	μg/m^3	μg/m^3	μg/m^3	μg/m^3
ACETALDEHYDE	100	4.72	22.80	**10.64**	0.45 (a)
ACROLEIN$_1$	*86*	*BDL*	***6.41***	*0.55*	*0.02 (b)*
BENZENE	100	0.78	6.97	**2.80**	0.12 (a)
CARBON TETRACHLORIDE	83	BDL	1.38	**0.56**	0.067 (a)
CHLOROFORM	74	BDL	18.41	**1.82**	0.043 (a)
FORMALDEHYDE	100	1.53	33.32	**11.12**	0.077 (a)
METHYLENE CHLORIDE	100	4.27	171.83	**22.66**	0.56 (a)
1,1,1 - TRICHLOROETHANE	42	BDL	5.18	2.38	6400 (b)
ACETONE	100	1.76	15.50	6.84	5900
ACETYLENE	100	1.70	22.67	5.12	ND
BENZALDEHYDE	100	0.35	2.93	1.03	ND
BUTYR/ISOBUTYRALDEHYDE	96	BDL	7.74	1.89	ND
CHLOROMETHANE	90	BDL	2.99	1.35	340 (b)
CROTONALDEHYDE	100	0.16	2.07	0.53	20 (b)
ETHYLBENZENE	100	0.43	13.46	2.63	1000 (b)
HEXANALDEHYDE	100	0.36	3.02	1.14	ND
ISOVALERALDEHYDE	53	BDL	0.61	0.31	ND
m,p - XYLENE	100	1.13	67.61	13.07	1500 (b)
N-OCTANE	100	0.42	51.81	7.47	4700 (b)
o - XYLENE	97	BDL	21.71	4.92	1500 (b)
PROPIONALDEHYDE	90	BDL	2.45	1.55	ND
PROPYLENE	100	0.33	5.77	1.73	ND
STYRENE	74	BDL	32.54	1.40	1000 (b)
TETRACHLOROETHYLENE	64	BDL	1.92	0.45	1.1 (a)
TOLUALDEHYDES	93	BDL	6.58	1.92	ND
VALERALDERHYDE	96	BDL	1.37	0.47	590 (b)
TOLUENE	100	3.66	211.13	12.02	400 (b)

Table 2. Chemicals found above detection limits on more than 25% of sampling days are indicated. Chemicals with average or peak (for class B ASILs) above the ASIL screening level are shown in bold. BDL= below detection limits. ND = no data. ASIL class is annotated as (a) or (b). Chemicals suspect due to quality control concerns are noted in italics.
Quality Control Notes:
1- Method Error

Table 3
Results Summary Railroad Site

	Detection frequency	Minimum value	Maximum value	Geometric mean	ASIL
Units	percent	μg/m^3	μg/m^3	μg/m^3	μg/m^3

ACROLEIN$_1$	100	0.30	**0.69**	0.49	0.02 (b)
1,1,1 - TRICHLOROETHANE	71	BDL	0.82	0.70	6400 (b)
1,2,4 TRIMETHYLBENZENE$_2$	*100*	*2.51*	*12.78*	*5.91*	ND
1,3,5 TRIMETHYLBENZENE$_2$	*71*	*BDL*	*2.95*	*2.02*	ND
1,4 DIOXANE$_{2,4}$	*42*	*BDL*	*5.77*	*4.87*	0.032 (a)
2-BUTANONE (MEK)$_2$	*71*	*BDL*	*5.31*	*4.04*	1000 (b)
2-PROPANOL$_2$	*85*	*BDL*	*9.09*	*4.59*	3300 (b)
4-ETHYLTOLUENE	42	BDL	8.85	7.63	ND
ACETALDEHYDE	100	1.96	5.40	2.97	0.45 (a)
ACETONE	100	1.14	8.34	3.80	900 (b)
BENZALDEHYDE	100	0.35	1.17	0.61	ND
BENZENE$_{2,4}$	*100*	*2.65*	*9.27*	*5.02*	0.12 (a)
BUTYR/ISOBUTYRALDEHYDE	83	BDL	1.53	0.83	ND
CARBON DISULFIDE$_2$	*71*	*BDL*	*7.16*	*4.90*	*100 (b)*
CARBON TETRACHLORIDE	57	BDL	0.88	0.76	0.067 (a)
CHLOROFORM	71	BDL	7.81	4.36	0.043 (a)
CHLOROMETHANE$_{3,4}$	*85*	*BDL*	*1.78*	*1.30*	340 (b)
ETHANOL$_{2,4}$	*100*	*18.84*	*52.76*	*29.96*	6300 (b)
ETHYLBENZENE$_2$	*85*	*BDL*	*4.26*	*2.39*	1000 (b)
FORMALDEHYDE	100	2.69	6.78	4.14	0.077 (a)
HEPTANE	57	BDL	3.77	2.93	5500 (b)
HEXANALDEHYDE	83	BDL	2.74	1.44	ND
HEXANE$_2$	*57*	*BDL*	*6.34*	*4.15*	200 (b)
ISOVALERALDEHYDE	50	BDL	0.21	0.16	ND
m,p - XYLENE$_2$	*100*	*4.34*	*18.24*	*8.32*	1500 (b)
METHYLENE CHLORIDE$_{2,4}$	*57*	*BDL*	*1.46*	*0.86*	0.56 (a)
o - XYLENE$_2$	*85*	*BDL*	*6.51*	*3.36*	1500 (b)
PROPIONALDEHYDE	100	0.36	2.27	0.66	ND
STYRENE	57	BDL	3.45	1.25	1000 (b)
TETRACHLOROETHYLENE	42	BDL	1.56	1.14	1.1 (a)
TOLUALDEHYDES	66	BDL	0.49	0.24	ND
TOLUENE$_{2,4}$	*100*	*8.67*	*27.51*	*15.78*	400 (b)
VALERALDERHYDE	83	BDL	0.78	0.43	590 (b)

Table 5. Chemicals found above detection limits on more than 25% of sampling days at the Railroad site are indicated. Sampling at the Railroad site was subjectively targeted to stagnant-air days. Chemicals with peak concentrations above the class B ASIL screening level are shown in bold. ND = no data. ASIL class is annotated as (a) or (b). BDL= below detection limit. Chemical data potentially flawed due to quality control concerns are noted in italics.
Quality Control Notes:
1. Method Error
2. Duplicates > 50% relative percent difference
3. Spike recovery >25% relative percent difference
4. Blanks >2X detection limit

GRAB SAMPLE

One "grab" sample was taken on a stagnant air-day during the evening commute period. The emission sources in the vicinity of the grab sample were essentially the same as those present at the Cornwall and Railroad sites. During the sampling period the canister was carried at hip-level and a regular route was followed along sidewalks in the downtown area bounded by Railroad Avenue, Bay Street, Magnolia Street, and Chestnut Street. There was relatively heavy vehicle traffic and stagnant, odorous air was noticeable at the time of sampling. The canister sample for VOC analysis was captured on September 8, 1997 for 60 minutes, starting at 5:00 PM Pacific Standard Time. A one-hour mechanical flow controller with filter metered flow to the canister. No direct quality control data were generated for the Grab Sample. Table 4 indicates the concentrations found during the 9/8/97 Grab Sample. Non-detects are not shown. Comparison to class A ASILs (carcinogen screening) is not appropriate for the Grab Sample because the data represent a one hour concentration average and class A ASILs are intended to be used on an annual concentration-average basis. Class B ASIL comparison is also not appropriate because class B ASILs are intended to be used on a 24-hour-concentration average basis.

Table 4
Downtown Bellingham Grab Sample-September 8, 1997

	$\mu g/m^3$
1,2,4 TRIMETHYLBENZENE	2.80
1,3,5 TRIMETHYLBENZENE$_{2}$	*0.84*
1,4 DIOXANE$_{2,4}$	*19.46*
2-BUTANONE(MEK)$_{2}$	*5.90*
2-PROPANOL$_{2}$	*31.95*
BENZENE$_{2,4}$	*10.54*
CARBON DISULFIDE$_{2}$	*3.43*
CHLOROFORM	1.95
CHLOROMETHANE$_{3,4}$	*1.42*
ETHANOL$_{2,4}$	*226.10*
ETHYLBENZENE$_{2}$	*1.66*
HEXANE$_{2}$	*10.22*
m,p - XYLENE$_{2}$	*5.21*
METHYLENE CHLORIDE$_{2,4}$	*2.88*
o - XYLENE$_{2}$	*1.78*
p -(1,4)- DICHLOROBENZENE$_{2}$	*2.47*
TOLUENE$_{2,4}$	*24.12*

Table 6. Grab sample results. 60-minute sampling duration. Non-detects are not shown. Chemical results suspect due to quality control concerns are noted in italics. Quality Control Notes:
1- Method Error
2- Duplicates > 50% relative percent difference
3- Spike recovery >25% relative percent difference
4- Blank >2X detection limit

<u>BAY STREET</u>

Bay Street-Site Characteristics

The Bay Street site was located downtown in an environment very similar to the Cornwall, Grab, and Railroad sites (Figure 1). The Bay site was closer to the industrial zone (less than about 1/4 mile), but was still in the influence of mobile source emissions from a parking lot and streets. The site was located approximately 200 feet from the main city streets of Chestnut Street and Roeder Avenue. The sample intake was located on the southwest corner of a three-story building approximately 15 feet above the surface of a parking lot and suspended approximately 3 feet from the corner of the building.

Bay Street-Sampling and Analysis Regimen

Some sampling periods at the Bay Street site were targeted to attempt capture of stagnant atmospheric conditions (noted in Appendix A). These targeted samples were not included in the summary statistics reported here. VOC samples were collected via the SIS automated sampler and analyzed by the ATL laboratory. Carbonyl samples were collected via the EPA automated sampler with a separate sampling line and thermal ozone scrubbing. The carbonyl sampler did not provide a purge cycle. The ERG laboratory analyzed all carbonyl samples. As discussed in the data quality review section above, chemicals with notable potential error issues based on quality control at the Bay and Yew sites are flagged in the results summary. Quality control data are provided in Appendix B.

Bay Street-Results Summary

The chemicals detected on less than 25% of the sampling days at Bay are listed in Appendix C. These chemicals are not reviewed further in this report. Results for the chemicals detected on more than 25% of the sampling days are indicated in Table 5.

<u>YEW STREET</u>

Yew Street-Site Characteristics

The Yew Street site was initially located at a storage building behind Bellingham Fire Department Station 4 (10 sample days). Starting on 6/11/99 the sampler was moved about 500 feet north and installed on the roof of a strip mall (6 sample days). The strip mall was directly adjacent to a retail gasoline dispensing station. These sample sites are treated as the same site in this report. The sampling area was situated at the base of the Alabama Hill residential area, about two miles east-northeast from the downtown core. Residential areas bordered the site, but light industrial activity occurs along Iowa and Kentucky streets directly to the west.

Yew Street-Sampling and Analysis Regimen

All samples at Yew were scheduled; none were targeted to atmospheric conditions. VOC samples were initially collected with an SIS automated sampler, but manual samples were taken after 12/13/98 because of reliability problems with the automatic sampler. Carbonyl samples were collected via the EPA automated sampler with a separate sampling line and thermal ozone scrubbing. The carbonyl sampler did not provide a purge cycle. The ERG laboratory analyzed all carbonyl samples. Quality control data are provided in Appendix B.

Yew Street-Results Summary

The chemicals detected on less than 25% of the sampling days at Yew are listed in Appendix C. These chemicals are not reviewed further in this report. Results for the chemicals detected on more than 25% of the sampling days at the Yew site are indicated in Table 6.

Table 5
Bay Site Results Summary

	Frequency of detection	Minimum value	Maximum value	Geometric mean	ASIL
Units	Percent	µg/m^3	µg/m^3	µg/m^3	µg/m^3
1,4 DIOXANE$_{2,4}$	*58*	*BDL*	*27.75*	***5.73***	0.032 (a)
ACETALDEHYDE	100	0.49	6.90	**1.75**	0.45 (a)
ACROLEIN$_1$	*84*	*BDL*	***0.39***	*0.11*	0.02 (b)
BENZENE$_{2,4}$	*100*	*0.86*	*10.22*	***2.74***	0.12 (a)
CARBON TETRACHLORIDE	27	BDL	3.90	**0.97**	0.067 (a)

CHLOROFORM	73	BDL	6.84	**2.04**	0.043 (a)
FORMALDEHYDE	100	0.72	14.27	**2.33**	0.077 (a)
METHYLENE CHLORIDE$_{2,4}$	*76*	*BDL*	*28.48*	***2.19***	0.56 (a)
p -(1,4)- DICHLOROBENZENE$_{2}$	*82*	*BDL*	*3.37*	***1.54***	1.5 (a)
1,2,4 TRIMETHYLBENZENE$_{2}$	*88*	*BDL*	*20.15*	*2.37*	ND
1,3,5 TRIMETHYLBENZENE$_{2}$	*55*	*BDL*	*2.46*	*0.99*	ND
2-BUTANONE(MEK)$_{2}$	*52*	*BDL*	*8.55*	*2.47*	1000 (b)
2-PROPANOL$_{2}$	*85*	*BDL*	*37.12*	*4.76*	3300 (b)
ACETONE	100	1.28	19.17	3.25	900 (b)
BENZALDEHYDE	97	BDL	2.65	0.27	ND
BROMOMETHANE$_{2,3}$	*36*	*BDL*	*3.61*	*1.13*	5 (b)
BUTYR/ISOBUTYRALDEHYDE	97	BDL	2.60	0.48	ND
CARBON DISULFIDE$_{2}$	*76*	*BDL*	*14.64*	*4.23*	100 (b)
CHLOROMETHANE$_{2,3,4}$	*79*	*BDL*	*5.05*	*1.52*	340 (b)
CROTONALDEHYDE	38	BDL	1.66	NA	20 (b)
ETHANOL$_{2,4}$	*100*	*7.16*	*67.83*	*21.49*	6300 (b)
ETHYLBENZENE$_{2}$	*82*	*BDL*	*4.69*	*1.10*	1000 (b)
HEXANALDEHYDE	97	BDL	5.24	0.18	ND
HEXANE$_{2}$	*30*	*BDL*	*6.70*	*3.36*	200 (b)
ISOVALERALDEHYDE	47	BDL	0.28	0.07	ND
m,p - XYLENE$_{2}$	*97*	*BDL*	*22.58*	*3.47*	1500 (b)
o - XYLENE$_{2}$	*88*	*BDL*	*7.82*	*1.45*	1500 (b)
PROPIONALDEHYDE	94	BDL	0.49	0.22	ND
TOLUALDEHYDES	69	BDL	0.84	NA	ND
TOLUENE$_{2,4}$	*100*	*2.41*	*30.90*	*6.91*	400 (b)
VALERALDERHYDE	88	BDL	2.85	0.12	590 (b)

Table 7. Chemicals found above detection limits on more than 25% of sampling days at the Bay site are indicated. Chemicals with average or peak (for class B ASILs) above the ASIL screening level are shown in bold. ND = no data. ASIL class is annotated as (a) or (b). BDL= below detection limit. Chemical data potentially flawed due to quality control concerns are noted in italics.

Quality Control Notes:

1. Method Error
2. Duplicates > 50% relative percent difference
3. Spike recovery >25% relative percent difference
4. Blanks >2X detection limit

Table 6
Results Summary
Yew Site

Notes	Frequency of detection	Minimum value	Maximum value	Geometric mean	ASIL
Units	Percent	µg/m^3	µg/m^3	µg/m^3	µg/m^3
1,4 DIOXANE$_{2,4}$	*67*	*BDL*	*20.90*	***9.94***	0.032 (a)
ACETALDEHYDE	93	BDL	5.26	**2.09**	0.45 (a)
ACROLEIN$_{1}$	*73*	*BDL*	***0.60***	*0.09*	0.02 (b)
BENZENE$_{2,4}$	*100*	*1.69*	*24.28*	***4.14***	0.12 (a)
FORMALDEHYDE	100	1.15	4.67	**2.47**	0.077 (a)
METHYLENE CHLORIDE$_{2,4}$	*53*	*BDL*	*1.25*	***0.81***	0.56 (a)
p -(1,4)- DICHLOROBENZENE$_{2}$	*27*	*BDL*	*2.65*	***1.53***	1.5 (a)

1,2,4 TRIMETHYLBENZENE$_2$	*93*	*BDL*	*11.80*	*2.88*	nd
1,3,5 TRIMETHYLBENZENE$_2$	*40*	*BDL*	*4.92*	*2.84*	nd
2-BUTANONE (MEK)$_2$	*33*	*BDL*	*10.56*	*3.06*	1000 (b)
4-ETHYLTOLUENE	33	BDL	7.87	5.39	nd
ACETONE	93	BDL	5.18	2.71	900 (b)
BENZALDEHYDE	100	0.13	0.69	0.28	nd
BUTYR/ISOBUTYRALDEHYDE	100	0.18	1.77	0.60	nd
CARBON DISULFIDE$_2$	*47*	*BDL*	*13.70*	*3.28*	100 (b)
CHLOROMETHANE$_{2,3,4}$	*67*	*BDL*	*2.06*	*1.53*	340 (b)
ETHANOL$_{2,4}$	*93*	*BDL*	*26.38*	*11.69*	6300 (b)
ETHYLBENZENE$_2$	*80*	*BDL*	*5.96*	*1.75*	1000 (b)
HEXANALDEHYDE	100	0.04	0.41	0.16	nd
HEXANE$_2$	*53*	*BDL*	*13.39*	*4.76*	200 (b)
ISOVALERALDEHYDE	60	BDL	0.18	0.07	nd
m,p - XYLENE$_2$	*100*	*1.56*	*25.62*	*5.34*	1500 (b)
o - XYLENE$_2$	*87*	*BDL*	*7.38*	*2.14*	1500 (b)
PROPIONALDEHYDE	100	0.12	2.23	0.31	nd
TOLUALDEHYDES	67	BDL	0.49	0.23	nd
TOLUENE$_{2,4}$	*100*	*3.24*	*60.30*	*11.60*	400 (b)
VALERALDERHYDE	87	BDL	0.32	0.18	590 (b)

Table 7. Chemicals found above detection limits on more than 25% of sampling days at the Yew site are indicated. Chemicals with average or peak (for class B ASILs) above the ASIL screening level are shown in bold. ND = no data. ASIL class is annotated as (a) or (b). BDL= below detection limit. Chemical results suspect due to quality control concerns are noted in italics.

Quality Control Notes:

1. Method Error
2. Duplicates > 50% relative percent difference
3. Spike recovery >25% relative percent difference
4. Blank >2X detection limit

REVIEW OF CHEMICALS ABOVE HEALTH PROTECTIVE SCREENING LEVELS

Nine chemicals were found at average or peak concentrations greater than the ASIL health screening benchmark at one or more sites. They are reviewed below.

1. Carbon Tetrachloride

The available quality control evaluations did not show any problems with the measurements of carbon tetrachloride. Carbon tetrachloride levels were typically below the detection limits at Yew because the mechanical samplers used at that site produced subatmospheric samples that resulted in higher detection limits. The Cornwall, Railroad and Bay sites yielded levels slightly over the detection limits. Average carbon tetrachloride levels were greater than the ASIL at Cornwall, Railroad and Bay (note that the detection limits were greater than the ASIL).

Carbon tetrachloride is a manufactured chemical that was historically used as an industrial and laboratory solvent. Federal law now prohibits its usage except in very limited circumstances. The NWAPA is not aware of any current carbon tetrachloride usage anywhere in Whatcom County. Some carbon tetrachloride may be emitted from wastewater treatment involving chlorine disinfection, but the NWAPA does not currently have accurate estimates of local emissions.

Carbon tetrachloride is relatively stable in the environment and is a common air contaminant. Some chemicals, particularly ones that degrade very slowly in air, are found at background levels nearly everywhere, even in remote areas. In support of EPA's cumulative exposure project, Rosenbaum, et al. (1999) compiled background concentration estimates for certain chemicals. Background concentrations are levels found nationwide, even in areas remote from known sources. The background level for carbon tetrachloride was 0.88 $\mu g/m^3$, which is greater than the ASIL of 0.067 $\mu g/m^3$ (annual average). The carbon tetrachloride levels found during the Bellingham monitoring project were about the same as the background level reported by Rosenbaum, et al. The carbon tetrachloride levels found in Bellingham were also about equivalent to levels found during a large-scale toxics monitoring project in Arizona (Zielinska, et al. 1998).

The similarity in concentrations between those found in Bellingham, and in other localities indicates that carbon tetrachloride is probably not unusually elevated in Bellingham.

2. 1,4-Dichlorobenzene

An issue was noted concerning poor agreement between 1,4-dichlorobenzene concentrations in duplicate samples. Duplicate results were good for the Cornwall sampler and for side-by-side mechanical samplers, but duplicates involving the Bay and Yew automatic samplers yielded very poor agreement (Appendix B).

1,4-Dichlorobenzene was typically below the detection limit at the Cornwall and Railroad sites. It was above the detection limit in 82% of the Bay samples and in the Grab sample. Deleting non-detects probably gives the calculated average for Yew an upward bias because 1,4-dichlorobenzene was above the detection limit in only 27% of the Yew sample days. 1,4-Dichlorobenzene measurements via mechanical samplers at Yew yielded below detection limit values in every case.

Average 1,4-dichlorobenzene levels at Bay and Yew were only slightly above the ASIL of 1.5 $\mu g/m^3$. The average levels were about the same at the Bay and Yew sites. The Grab sample indicated a higher concentration. 1,4-dichlorobenzene data generated from the Bay and Yew automatic samplers have low certainty because of the poor duplicate agreement.

1,4-dichlorobenzene is used as a deodorant in portable toilets and refuse containers and as a moth/mildew fumigant. It is also used as a chemical manufacturing intermediate. The NWAPA maintains an inventory of air toxics emissions in the area. No facility has reported emissions of 1,4-dichlorobenzene to the NWAPA.

A California Air Resources Board (CARB) information sheet on 1,4 dichlorobenzene reported average outdoor concentrations across all monitoring stations to be 0.72 $\mu g/m^3$ and reported mean concentrations inside residences to range from 4.0 to 13.8 $\mu g/m^3$ (CARB, 1999). The average levels of 1,4-dichlorobenzene at Bay (1.54 $\mu g/m^3$) and Yew (1.53 µg/m3) appear to be higher than average levels reported by other air toxics monitoring projects, but the values from Bay and Yew are very uncertain because of quality control issues.

3. 1,4-Dioxane

The poor results from duplicate and spike quality control tests for 1,4-dioxane indicate that the concentration data are unreliable. 1,4-Dioxane quality control measurements indicated contamination issues in both the Bay and Yew automatic samplers. One blank indicated severe sample contamination, but other blanks were reasonably good. There was poor agreement between duplicate analyses of 1,4-dioxane in tests involving both automatic samplers and mechanical samplers. 1,4-dioxane, also known as diethylene dioxide, was not monitored at Cornwall, but was consistently found above the detection limits and ASIL at all of the other sites. The highest average concentration was found at Yew.

1,4-Dioxane is used in many different products and processes. It is a component of some paints, varnishes, inks and solvents. It is sometimes used as a solvent in the paper and textile processing industries, it is sometimes present in shampoos, cosmetics and pharmaceuticals. No facility currently reports emissions of 1,4-dioxane to the NWAPA.

There was very little information available regarding typical ambient or indoor levels of 1,4-dioxane at the time of this writing. Few of the available monitoring studies measured 1,4-dioxane. EPA compiled ambient 1,4-dioxane measurements performed at 45 locations in 12 cities taken between 1979 and 1984. The results indicated concentrations ranging from below detection limits to 30 $\mu g/m^3$ (Larry Cupitt, EPA, personal communication. 12/28/99).

The 1,4-dioxane levels measured in Bellingham were within the range of concentrations reported by the EPA. Quality control concerns limit further interpretation of 1,4-dioxane levels in Bellingham.

4. Acrolein

As noted, the EPA determined that methods TO-11 and TO-11A do not reliably quantify acrolein concentrations because of sample degradation. The results provided here are, therefore, highly uncertain. No other quality control concerns were noted from the quality control data.

Acrolein was found above the detection limit at all of the sites. The frequency of detection ranged from 73 to 100% of the samples (100% on targeted days). All of the values recorded were above the class B ASIL. Peak and average value comparisons are shown in Table 7, below.

Table 7
Acrolein Comparisons

	Cornwall	Railroad*	Bay	Yew
24-hr Peak	6.41 (2nd peak = 2.9)	0.69	0.39	0.60
Site Mean	0.55	0.49	0.11	0.09

Table 7. Acrolein comparisons; units are $\mu g/m^3$. * Railroad samples were targeted to stagnant conditions.

The peak acrolein level at Cornwall was appreciably higher than the second highest acrolein value at Cornwall of 2.9 $\mu g/m^3$. Acrolein values at Cornwall were typically higher than the other sites, although targeted sampling at Railroad resulted in average values approximately the same as at Cornwall.

Emissions may result from the manufacture and use of acrolein in various products; no such use of acrolein in Bellingham is evident from the NWAPA emission inventory. The emission inventory indicates acrolein emitted from combustion sources. Gasoline and diesel engines, and combustion in home heating appliances and industrial heaters and boilers emit acrolein. Acrolein is very reactive and does not persist long in the atmosphere.

The peak acrolein levels found at Bay, Yew and Railroad were consistent with levels reported in other studies. The peak level at Cornwall was higher than values reported in the available ambient studies. EPA's 1997 Urban Air Toxics Monitoring Program report showed peak acrolein concentrations measured at 12 locations to range from 0.09 to 1.88 μg/m^3 (EPA, 1999). A California Air Resources Board fact sheet for acrolein addressed indoor levels: "Acrolein was measured in 59 of 128 homes studied in Woodland, California. The average indoor concentration of acrolein was reported as 7.1 μg/m^3 with a standard error of 1.7 μg/m^3" (CARB, 1999).

The higher acrolein levels at Cornwall are consistent with the close proximity of the sampling probe to vehicle emissions occurring at the intersection of Cornwall Avenue and Magnolia Street. Mobile sources emit significant amounts of aldehydes, including acrolein, especially during idling and acceleration. The Bay and Yew sites are located farther from traffic than is the Cornwall site, and the peak acrolein levels were lower at Bay and Yew than were the peaks at Cornwall. This association between vehicle exhaust and measured levels is circumstantial, but it is consistent with the data and positioning of the monitor.

5. *Acetaldehyde*

No quality control issues were noted from the available data, except the 1995 UATMP report, which includes data from the Cornwall site, indicated that there was an issue concerning poor acetaldehyde spike measurement performance at the ERG laboratory that measured the Cornwall samples (EPA, 1997). Average acetaldehyde levels were above the Class A-ASIL at all of the monitoring sites. Acetaldehyde was not measured in the Grab sample. Acetaldehyde levels are summarized in Table 8, below.

Table 8
Acetaldehyde Comparisons

	Cornwall	Railroad*	Bay	Yew
Site Mean	10.64	2.97	1.75	2.09

Table 8. Total site average acetaldehyde comparisons; units are μg/m^3. * Railroad samples were targeted to stagnant conditions.

Acetaldehyde is used in the synthetic organic chemical manufacturing industry and in various manufacturing processes; industrial emissions of acetaldehyde in Bellingham are reported in the NWAPA emission inventory. The emission inventory also indicates acetaldehyde emitted from combustion sources. Gasoline and diesel engines, and combustion in home heating combustion appliances and industrial heaters and boilers emit acetaldehyde. Acetaldehyde is also formed secondarily through photo-oxidation of organic chemicals in the atmosphere.

Average acetaldehyde levels at Bay and Yew were approximately the same as the average level measured at monitoring sites in the lower Fraser Valley (1.8 μg/m^3) (GVRD, 1998). Average levels at Cornwall were higher than most urban monitoring sites, but higher levels were reported from Brownsville, Texas in the 1995 UATMP (avg. 17.4 μg/m^3) (EPA, 1997). A California Air Resources Board fact sheet for acetaldehyde indicated that their monitoring network's mean concentration of acetaldehyde from January 1996 through December 1996 is estimated to be 2.39 μg/m^3 (CARB, 1999). The CARB fact sheet also noted average acetaldehyde concentration inside residences to range from 5.4 to 27.0 μg/m^3.

The similarity in concentrations between those found in Bellingham, and in other localities indicates that acetaldehyde is probably not unusually elevated at the Bay and Yew sites. The higher levels at Cornwall probably result from the close proximity of the sampler to vehicle emissions, but significant industrial emissions of acetaldehyde in the downtown industrial area likely add to the levels.

6. *Formaldehyde*

The available quality control evaluations did not show any problems with the measurements of formaldehyde. Formaldehyde was above the detection limits in every sample (not included in the Grab sample). The formaldehyde detection limits were greater than the ASIL. As indicated in Table 9, below, average levels were greatest at Cornwall, and were lowest at Bay and Yew.

Table 9
Formaldehyde Comparisons

	Cornwall	Railroad*	Bay	Yew
Site Mean	11.12	4.14	2.33	2.47

Table 9. Average formaldehyde comparisons; units are μg/m^3. * Railroad samples were targeted to stagnant conditions.

Formaldehyde is emitted directly from combustion sources, especially vehicular exhaust. Formaldehyde may be emitted from chemical processing, petroleum refining, wood products (e.g. plywood) manufacturing, and a variety of other processes. Formaldehyde is emitted from some wood fiber products (pressboard, etc.), and some antimicrobial products contain formaldehyde. Formaldehyde is also formed secondarily through photo-oxidation of organic compounds.

Formaldehyde levels in Bellingham were within the range of concentrations found at other urban locations. The 1995 UATMP results from 15 monitoring locations (including Cornwall) showed average formaldehyde concentrations to range from 17.66 μg/m^3 to 0.97 μg/m^3 (EPA, 1997). The GVRD study indicated an average formaldehyde concentration of 2.4 μg/m^3 (GVRD, 1998). The CARB fact sheet for formaldehyde indicated that their monitoring network's mean concentration of formaldehyde from January 1996 through December 1996 is estimated to be 4.15 μg/m^3 (CARB, 1999). The CARB fact sheet also noted average formaldehyde concentration inside residences to range from less than 12.3 to almost 500 μg/m^3. The fact sheet noted that indoor formaldehyde emissions appear to be come from pressed wood products and indoor combustion sources.

As with acetaldehyde, high formaldehyde levels at Cornwall most likely result from vehicular exhaust and contributions from nearby industrial sources. Levels at Bay and Yew do not appear to be unusually elevated when compared to results from other urban monitoring studies.

7. Chloroform

Chloroform duplicate agreement was good except for one test involving the Yew and Bay automatic samplers. Chloroform spike recovery was within the screening limits of the study. Chloroform blanks performed well. No other undue quality control issues respecting chloroform were evident from the available data.

Table 10
Chloroform Comparisons

	Cornwall	Railroad*	Bay	Yew

Site Mean	1.82	4.36	2.04	BDL in 87% of samples
Table 10. Average chloroform comparisons; units are $\mu g/m^3$. * Railroad samples were targeted to stagnant conditions. BDL = below detection limits.				

As shown in Table 10, above, average chloroform concentrations were highest at Railroad, where samples were targeted to stagnant air days. The Bay and Cornwall average concentrations were relatively close together.

Chloroform is emitted from some chemical manufacturing facilities, pulp mills, and water/wastewater treatment facilities. Chloroform can be emitted inside residences from disinfectant product use and during household use and drinking of chlorinated water. Chloroform exposures occur during bathing and swimming in chlorinated water.

The GVRD study indicated an average chloroform concentration of 0.12 $\mu g/m^3$ in the lower Fraser Valley (GVRD, 1998). The CARB fact sheet for chloroform indicated that their monitoring network's mean concentration of chloroform from January 1996 through December 1996 is estimated to be 0.176 $\mu g/m^3$ (CARB, 1999). EPA studies indicate outdoor concentrations in urban areas to average 1 $\mu g/m^3$ (Lance Wallace, Personal Communication. 1/4/2000).

EPA studies have found significant chloroform exposures to occur via inhalation and skin absorption during showers in chlorinated water. For water with moderately high chloroform levels, values in the shower air can reach 488 $\mu g/m^3$ after ten minutes. Average levels of chloroform in areas of the home other than the bathroom were approximately 4.8 $\mu g/m^3$ (Lance Wallace, Personal Communication.1/4/2000).

Chloroform levels in the downtown area of Bellingham appear to be higher than ambient levels found in most other urban areas. Industrial emissions of chloroform probably explain the higher levels downtown.

8. Methylene chloride

Methylene chloride duplicate assessments from Cornwall were satisfactory. Duplicate performance in comparisons involving the Bay, Yew, and mechanical samplers were generally poor (see Appendix B). There was contamination in some blanks, but other blanks were good. Methylene chloride data from Railroad, Bay, and Yew is suspect because of these quality control concerns. Average methylene chloride levels at the sampling sites are listed in Table 11, below.

Table 11
Methylene Chloride Comparisons

	Cornwall	Railroad*	Bay	Yew
Site Mean	22.66	0.86	2.19	0.81
Table 11. Average methylene chloride comparisons; units are $\mu g/m^3$. * Railroad samples were targeted to stagnant conditions.				

Methylene chloride is used as a solvent, a blowing and cleaning agent in the manufacture of polyurethane foam and plastic fabrication, and in paint stripping operations. Methylene chloride is also used in some aerosol consumer products, including aerosol paints, and automotive products.

Methylene chloride can be emitted from all of these uses. Methylene chloride can also be emitted from some industrial combustion processes. The federal emission inventory for Whatcom County generically indicates emissions from solvent use.

The CARB fact sheet for methylene chloride indicated that their monitoring network's mean concentration of methylene chloride from January 1996 through December 1996 is estimated to be 2.26 $\mu g/m^3$ (CARB, 1999). Rosenbaum, et al. reported a North American background concentration of 0.15 $\mu g/m^3$ (1999). The GVRD study indicated an average methylene chloride level of 0.81 $\mu g/m^3$ in the Lower Fraser Valley (GVRD, 1998). The CARB fact sheet for methylene chloride reported residential (indoor) concentrations ranging from 1.05 to 13.65 $\mu g/m^3$ (CARB, 1999).

Methylene chloride levels at Railroad and Yew seem to correspond well with levels found by the GVRD and were lower than levels reported by CARB. The average at Bay was comparable to the CARB findings. But, levels there may be influenced by some local source considering the peak at Bay was much higher than the peaks at Railroad and Yew and the frequency of detection was greater at Bay than it was at Railroad and Yew. The average and peak methylene chloride levels recorded at Cornwall are much greater than levels reported by other monitoring studies, including levels found inside residences.

The high methylene chloride levels at Cornwall, and lower levels at Railroad and Bay, indicate that there was probably a strong local emission source near the Cornwall sampler. Some methylene chloride emissions are reported from combustion sources at the pulp mill, but those emissions would likely cause levels at Railroad and Bay to approximate levels found at Cornwall. NWAPA staff looked in the downtown area for potential sources of methylene chloride (e.g. furniture stripping, painting, manufacturing…etc.). No likely source was found other than reports of graffiti removal solvent used to clean the exteriors of downtown buildings. Most graffiti removal solvents examined at a local supply store were composed primarily of methylene chloride. Interviews with building maintenance staff working in the vicinity of the Cornwall sampler revealed that graffiti removal is a regular task in the downtown area. The exact source responsible for high methylene chloride levels at Cornwall is unknown.

9. ***Benzene***

Benzene duplicate assessments from Cornwall were satisfactory. Duplicate performance in comparisons involving the Bay, Yew, and mechanical samplers were generally poor (see Appendix B). There was contamination in some blanks, but other blanks were good. Benzene data from Railroad, Bay, and Yew are suspect because of these quality control concerns. Average benzene levels at the sampling sites are listed in Table 12, below.

Table 12
Benzene Comparisons

	Cornwall	Railroad*	Bay	Yew
Site Mean	2.8	5.02	2.74	4.14

Table 12. Average benzene comparisons; units are $\mu g/m^3$. * Railroad samples were targeted to stagnant conditions.

Benzene is primarily emitted from gasoline motor vehicle exhaust and from gasoline manufacture, storage and transfer. It may also be emitted from some manufacturing processes and from burning plant material (outdoor burning, woodstoves, tobacco smoke…etc.). The NWAPA inventory indicates benzene emissions from fuel combustion and gasoline marketing in the downtown area.

The CARB fact sheet for benzene indicated that their monitoring network's mean concentration of benzene from January 1996 through December 1996 is estimated to be 2.26 $\mu g/m^3$ (CARB, 1999). Rosenbaum, et al. reported a North American background concentration of 0.48 $\mu g/m^3$ (1999). The GVRD study indicated an average benzene level of 2.7 $\mu g/m^3$ in the Lower Fraser Valley (GVRD, 1998). The CARB fact sheet for benzene reported residential (indoor) concentrations ranging from 0.28 to 16.4 $\mu g/m^3$ (CARB, 1999).

Benzene levels at Cornwall and Bay were about the same and correspond well with the levels reported by GVRD and CARB. Higher benzene levels at Yew might result from emissions from a nearby gasoline station (located within 300 feet of the sampler), although other gasoline components do not reflect this pattern. For example, if benzene at Yew is elevated due to gasoline evaporation, then ethylbenzene, xylene, and toluene should be highest there too, as these chemicals are common components of gasoline. This pattern was not evident.

Conclusions and Recommendations

Several conclusions can be reached from our basic review of the monitoring results. First of all, it is notable that many of the chemicals monitored were found at levels below the ASIL health screening benchmarks. These chemicals probably do not, by themselves, pose a community health issue. Another conclusion is that this screening project does not wholly evaluate chemicals that do not have ASIL health screening benchmarks. Further, in cases where the ASIL is below the detection limit *and* analytical reports were below the detection limit, we cannot evaluate with respect to the health screening benchmark. That is, levels could be below detection, yet still be above the ASIL. These evaluations are outside the scope of this project. The main conclusion of the screening phase of the project is that, of the chemicals addressed, nine were found at levels above the health screening benchmark at one or more sampling locations. These chemicals warrant further evaluation and are addressed below.

It is possible to evaluate the chemicals of concern by considering quality control results, measured levels, health screening benchmarks, levels found in other localities, and current regulatory programs. The EPA is undertaking varied and extensive efforts to address air toxics. The NWAPA is involved in implementing the regulatory programs that EPA enacts. Information regarding EPA's air toxics program is available from the NWAPA or via the Internet at (http://www.epa.gov/ttnuatw1).

Consideration of the monitoring results in the context of these factors yields the following conclusions:

1. Our review of the literature indicated that the concentrations of many of the subject chemicals appear to be typically higher inside residences than they are in the outside air. Ventilation patterns, indoor emission sources, and outdoor concentrations can influence indoor concentrations. The NWAPA does not regulate air contamination inside homes, but we, and several other agencies, provide assistance to people concerned about indoor air quality. We encourage personal action to improve indoor air quality. Furthermore, we view outdoor air quality improvement programs to be generally beneficial to the improvement of indoor air.

2. Carbon tetrachloride was found above the health screening level at most of the sites, but the levels found were approximately the same as the North American background level. The background carbon tetrachloride level likely result from historical emissions and the persistence of the chemical in the atmosphere, so a local program to reduce carbon tetrachloride levels would probably not be effective. The levels of carbon tetrachloride in Bellingham suggest that there is probably not a strong local emission source. No unique local action regarding carbon tetrachloride is recommended.

3. Levels of 1,4-dichlorobenzene were only slightly above the ASILs at Bay and Yew and were typically below detection limits at Cornwall and Railroad. Some of the duplicates indicated poor reproducibility. Dichlorobenzene levels fluctuated, indicating that there may be a local emission source, which is currently unknown. We recommend an attempt to identify local sources and an evaluation of control strategies.

4. Levels of 1,4-dioxane were higher than the ASIL, and they were highest at Yew, but the data should be viewed with suspicion because of extremely poor quality control results. This chemical appears to be present in many different consumer products and may be emitted from a wide variety of commercial and industrial processes. We recommend additional limited monitoring to accurately quantify 1,4-dioxane levels. We also recommend investigation of local emission sources.

5. Benzene is a common contaminant in urban air, emitted primarily from motor vehicles, gasoline marketing, and combustion sources. The levels in Bellingham appear to be about the same as levels in most other cities. It is notable that stagnant air-days seem to produce higher benzene concentrations (see Grab sample and Railroad results). The benzene results add support to regulatory efforts to reduce emissions from motor vehicles and gasoline marketing. As new federal motor vehicle emission limits come into place, and as the population of motor vehicles is renewed, benzene levels should decline. We recommend no unique local action regarding benzene at this time other than continuing to encourage lower emitting forms of transportation.

6. Acrolein is primarily emitted by combustion sources, especially motor vehicles. Of the sampling sites, Cornwall is the site with the highest acrolein peaks and is probably the site most influenced by motor vehicle exhaust. The peak acrolein levels at the other sites are in range with levels reported from other urban locations. As new federal motor vehicle emission limits come into place, and as the population of motor vehicles is renewed, acrolein levels should decline. We recommend consultation with Health Department experts regarding the acrolein data.

7. Acetaldehyde and formaldehyde are emitted by motor vehicles, many combustion sources, and from industrial processes in the downtown area. Cornwall yielded the highest concentrations of these chemicals. Average levels at Bay and Yew were lower and approximated levels found in other cities. As new federal motor vehicle emission limits come into place, and as the population of motor vehicles is renewed, acetaldehyde and formaldehyde levels should decline. We recommend consultation with Health Department experts regarding the acetaldehyde and formaldehyde data. We also recommend an attempt to determine the contribution local industrial sources may make to downtown levels of acetaldehyde and formaldehyde.

8. Methylene chloride levels were quite high at Cornwall, but concentrations at the other sampling sites approximated typical urban levels. The pulp mill near downtown reports emissions of methylene chloride, but the ambient levels of methylene chloride found seem inconsistent with the quantities reported. For example, much higher emissions of chloroform than methylene chloride are reported from the mill, but ambient chloroform levels are lower. The atmospheric persistence of the chemicals are approximately similar. The evidence suggests that there was a strong methylene chloride emission source near the Cornwall sampler. Investigation downtown has not revealed any methylene chloride use except graffiti cleaning activities. We recommend a detailed investigation of methylene chloride emission sources downtown and an evaluation of control strategies. We also recommend limited additional methylene chloride testing at or near the Cornwall site.

9. Average chloroform levels in downtown Bellingham appear to be higher than average levels in most urban areas. Levels at Yew were much lower, typically below detection limits. The Georgia Pacific-West pulp mill (GP) located near downtown is a source of chloroform emissions in the downtown area. Chloroform emissions from GP were reduced at the beginning of 1998 due to process modifications. Further process modifications in response to federal regulations will be in place by the end of 2000 or early 2001. These modifications are expected to reduce total plant chloroform emissions by approximately 60-80%. We recommend a reassessment of ambient chloroform levels after the emissions reductions take place.

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Date Sampled				8/13/95	8/19/95	8/25/95	9/18/1995
Location				cornwall	cornwall	cornwall	cornwall
Carbonyl lab				ERG	ERG	ERG	ERG
Day of the Week				SU	SA	F	M
Notes							
sample start time (PST)				0	0	0	0
sample duration (minutes)				1440	1440	1440	1440
Notes	CAS #	ERG Lab Detection Limit					dup 1
Units		mg/m^3	mol. wt.	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	50-00-0	0.004	30.03	14.52	16.03	18.75	14.56
ACETALDEHYDE	75-07-0	0.005	44.05	4.90	4.35	4.81	5.74
ACROLEIN	107-02-8	0.007	56.07	0.21	0.27	0.12	0.22
ACETONE	67-64-1	0.007	58.08	1.77	2.70	2.52	1.96
PROPIONALDEHYDE	123-38-6	0.007	58.08	0.58	0.59	0.73	1.03
CROTONALDEHYDE	4170-30-3	0.029	70.09	0.21	0.13	0.18	0.16
BUTYR/ISOBUTYRALDEHYDE	78-84-2	0.009	72.12	0.52	0.74	0.54	0.60
BENZALDEHYDE	100-52-7	0.043	106.12	0.32	0.20	0.34	
ISOVALERALDEHYDE	590-86-3	0.018	86.14	0.08	0.10	0.07	0.14
VALERALDERHYDE	110-62-3	0.018	86.14	0.23	0.31	0.39	0.23
TOLUALDEHYDES	529-20-4	0.147	120.16	0.16	0.30	0.56	0.54
HEXANALDEHYDE	66-25-1	0.008	100.16	0.24	0.28	0.26	0.22
Date Sampled	9/18/1995	9/30/95	10/24/95	11/05/95	11/17/95	11/29/95	12/11/95
Location	cornwall	cornwall	cornwall	cornwall	cornwall	cornwall	cornwall
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	M	SA	TU	SU	F	W	M
Notes							
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes	dup 2						
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	12.65	10.19	2.26	1.25	1.40	2.25	6.74
ACETALDEHYDE	4.91	4.16	4.42	7.02	2.62	7.47	4.34
ACROLEIN	0.18	0.14	0.26	0.28	0.03	0.56	0.09
ACETONE	1.40	2.33	3.14	1.48	0.74	1.43	1.63
PROPIONALDEHYDE	0.89	0.64	0.70	0.63	0.35	0.73	0.59
CROTONALDEHYDE	0.13	0.11	0.18	0.09	0.08	0.10	0.19
BUTYR/ISOBUTYRALDEHYDE	0.52	0.50	0.62	0.62	0.36	0.65	0.50
BENZALDEHYDE	0.26	0.22	0.10	0.13	0.14	0.17	0.38
ISOVALERALDEHYDE	0.12	0.04	0.17		0.01	0.15	
VALERALDERHYDE	0.22	0.23	0.11	0.09	0.17	0.27	0.06
TOLUALDEHYDES	0.40	0.34	0.85	0.20	0.12	0.45	0.54
HEXANALDEHYDE	0.16	0.16	0.10	0.39	0.47	0.09	0.46

Date Sampled	***12/23/95***	***1/22/96***	***1/28/96***	***2/9/96***	***2/21/96***	***3/4/1996***	***3/16/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	SA	M	SU	F	W	M	SA
Notes							
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes							
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	16.33	10.85	6.67	15.15	7.33	6.65	6.95
ACETALDEHYDE	7.03	3.92	3.64	6.10	4.54	3.68	5.56
ACROLEIN	0.38	0.12	0.06	2.80	0.19		
ACETONE	6.46	5.47	5.16	5.21	2.92	3.98	2.27
PROPIONALDEHYDE	1.03	0.57	0.50	0.70	0.63		0.48
CROTONALDEHYDE	0.45	0.14	0.06	0.23	0.17	0.16	0.17
BUTYR/ISOBUTYRALDEHYDE	1.00		0.36	2.62	0.62	0.46	0.47
BENZALDEHYDE	0.68	0.26	0.08	0.37	0.40	0.21	0.16
ISOVALERALDEHYDE	0.11			0.17			0.06
VALERALDERHYDE	0.22	0.06	0.02	0.07	0.15		0.08
TOLUALDEHYDES	1.34	0.57	0.16	0.42	0.85		
HEXANALDEHYDE	0.57	0.27	0.12	0.11	0.45	0.25	0.41
Date Sampled	***3/28/1996***	***4/9/1996***	***4/21/1996***	***5/3/1996***	***5/15/1996***	***5/27/1996***	***6/11/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	TH	TU	SU	F	W	M	T
Notes							
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes							
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	8.65	8.02	9.01	8.49	10.25	9.01	10.92
ACETALDEHYDE	10.12	3.56	6.35	9.32	7.05	8.70	8.16
ACROLEIN	0.27	0.18	0.23	0.08	0.16	0.53	
ACETONE	5.82	1.46	2.92	3.15	3.08	2.42	4.11
PROPIONALDEHYDE	0.76	0.61	0.82	0.62	0.64	0.55	
CROTONALDEHYDE	0.18	0.24	0.16	0.13	0.19	0.13	0.18
BUTYR/ISOBUTYRALDEHYDE	0.88	0.37	0.64	0.49	0.58	0.71	0.55
BENZALDEHYDE	0.16	0.28	0.34	0.19	0.15	0.10	0.17
ISOVALERALDEHYDE	0.14		0.17		0.09	0.10	
VALERALDERHYDE	0.16	0.07	0.22	0.10	0.07	0.05	0.15
TOLUALDEHYDES	0.64	0.46	0.46	0.31	0.30	0.23	0.17
HEXANALDEHYDE	0.54	0.33	0.71	0.22	0.17	0.13	0.15

Date Sampled	***6/20/1996***	***7/2/1996***	***7/20/1996***	***7/26/1996***	***8/8/1996***	***8/19/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	TH	T	SA	F	TH	M
Notes						
sample start time (PST)	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440
Notes						
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	12.50	22.08	16.31	23.31	27.13	15.08
ACETALDEHYDE	9.17	8.89	6.43	11.30	12.66	5.05
ACROLEIN	0.25	0.44	0.25	0.78	1.26	
ACETONE	5.16	1.93	2.47	2.89	5.60	6.53
PROPIONALDEHYDE	0.71	0.75	0.53	0.85	0.73	
CROTONALDEHYDE	0.28	0.50	0.30	0.64	0.72	0.22
BUTYR/ISOBUTYRALDEHYDE	0.71	0.93	0.59	0.88	1.91	0.55
BENZALDEHYDE	0.32	0.39	0.23	0.51	0.50	0.29
ISOVALERALDEHYDE		0.08				
VALERALDERHYDE	0.19	0.30	0.09	0.16	0.31	0.18
TOLUALDEHYDES	0.41	0.34	0.31	0.44	0.70	0.55
HEXANALDEHYDE	0.25	0.35	0.32	0.69	0.74	0.47
Date Sampled	***8/18/1997***	***9/2/1997***	***9/25/1997***	***10/7/1997***	***10/13/1997***	***10/16/1997***
Location	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***
Carbonyl lab	ATL	ATL	ERG	ERG	ERG	ERG
Day of the Week	M	T	TH	T	M	TH
Notes	targeted	targeted	targeted	targeted	targeted	targeted
sample start time (PST)	1625	950	0	0	1512	1512
sample duration (minutes)	1440	1440	1440	1440	1440	528
Notes	No ozone scrubber					
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	2.42	2.42	5.52	4.44	4.68	2.19
ACETALDEHYDE	1.26	1.09	3.00	1.96	2.22	1.12
ACROLEIN	NA	NA	0.30	0.19	0.28	0.13
ACETONE	0.48	0.54	3.24	2.97	3.51	1.93
PROPIONALDEHYDE	0.96	0.24	0.25	0.15	0.35	0.15
CROTONALDEHYDE	ND0.02	ND0.022	ND	ND	ND	ND
BUTYR/ISOBUTYRALDEHYDE	ND0.02	0.17	0.52	0.41	0.51	0.1
BENZALDEHYDE	0.08	0.09	0.27	0.19	0.22	0.1
ISOVALERALDEHYDE	ND0.018	ND0.018	0.06	0.04	0.04	ND
VALERALDERHYDE	ND0.018	0.13	0.15	0.11	0.22	0.06
TOLUALDEHYDES	ND0.013	ND0.013	0.10	0.05	0.06	0.02
HEXANALDEHYDE	ND0.015	0.12	0.59	0.46	0.67	0.24

Date Sampled	11/13/1997	12/2/1997	12/4/1997	12/4/1997	12/30/1997	2/5/1998	2/18/1998
Location	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	TH	T	TH	TH	T	TH	W
Notes	targeted	targeted					
sample start time (PST)	1200*	1400	1205	1205	1145	0	0
sample duration (minutes)	2160	1440	1440	1440	1440	1440	1440
Notes	*sample stopped and restarted		dup 1	dup 2			
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	5.21	3.39	3.21	2.99	1.69	1.25	0.61
ACETALDEHYDE	2.61	1.45	1.31	1.24	0.7	0.48	0.27
ACROLEIN	0.16	0.08	0.09	0.07	0.07	0.03	0.01
ACETONE	3.76	2.42	2.29	2.07	1.35	0.95	0.64
PROPIONALDEHYDE	0.2	0.12	0.11	0.08	0.11	0.06	0.04
CROTONALDEHYDE	ND	ND	ND	ND	ND	0.05	ND
BUTYR/ISOBUTYRALDEHYDE	0.31	0.21	0.18	0.20	0.04	0.07	0.02
BENZALDEHYDE	0.22	0.12	0.13	0.11	0.05	0.05	0.02
ISOVALERALDEHYDE	0.08	0.01	ND	ND	ND	ND	ND
VALERALDERHYDE	0.03	0.01	0.02	0.01	0.01	0.01	ND
TOLUALDEHYDES	0.14	0.04	0.07	0.06	0.05	ND	ND
HEXANALDEHYDE	0.09	0.04	0.04	0.04	0.03	0.04	0.03
Date Sampled	2/28/1998	3/4/1998	3/18/1998	4/11/1998	4/23/1998	5/17/1998	6/25/1998
Location	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	SA	W	W	SA	TH	SU	Th
Notes		targeted					
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes							
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	
FORMALDEHYDE	1.47	1.12	1.44	0.59	1.08	0.83	3.24
ACETALDEHYDE	0.61	0.48	0.87	0.31	0.57	0.6	1.72
ACROLEIN	0.05	0.02	0.07	0.05	0.04	0.08	0.17
ACETONE	0.9	0.88	1.2	0.54	1.27	0.87	4.4
PROPIONALDEHYDE	0.07	0.05	0.08	0.06	0.08	0.05	ND
CROTONALDEHYDE	0.04	0.03	0.04	ND	ND	ND	ND
BUTYR/ISOBUTYRALDEHYDE	0.05	0.05	0.14	0.23	0.24	0.06	0.31
BENZALDEHYDE	0.03	0.03	0.05	0.04	0.06	0.04	ND
ISOVALERALDEHYDE	ND	ND	0.04	ND	0.02	ND	ND
VALERALDERHYDE	ND	ND	0.01	0.03	0.04	0.03	ND
TOLUALDEHYDES	0.02	0.03	ND	0.06	0.06	ND	ND
HEXANALDEHYDE	0.03	0.02	0.05	0.04	0.05	0.04	0.21

Date Sampled	7/8/1998	7/17/1998	7/30/1998	9/2/1998	9/23/1998	10/2/1998	10/15/1998
Location	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	W	F	Th	W	W	F	Th
Notes							
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes		targeted					
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	1.16	1.19	1.22	1.45	2.33	1.59	2.32
ACETALDEHYDE	0.69	0.72	0.97	1.14	1.62	0.8	1.76
ACROLEIN	0.05	0.03	0.1	0.04	0.09	0.04	0.04
ACETONE	0.61	0.44	1.09	1.1	2.6	1.49	1.76
PROPIONALDEHYDE	0.05	0.04	0.06	0.08	0.17	0.08	0.11
CROTONALDEHYDE	ND	ND	ND	ND	ND	ND	ND
BUTYR/ISOBUTYRALDEHYDE	0.1	0.09	ND	0.29	0.29	0.58	0.68
BENZALDEHYDE	0.03	0.04	0.04	0.04	0.11	0.06	0.08
ISOVALERALDEHYDE	ND	ND	ND	ND	0.02	ND	ND
VALERALDERHYDE	ND	ND	0.02	0.02	0.06	0.03	0.04
TOLUALDEHYDES	ND	ND	0.04	ND	0.06	ND	ND
HEXANALDEHYDE	0.02	0.02	0.02	0.02	0.09	0.05	0.03
Date Sampled	10/28/1998	11/19/1998	12/13/1998	3/11/1999	3/11/1999	3/23/1999	3/23/1999
Location	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	W	Th	Su	Th	Th	Tu	Tu
Notes				Dup 1	Dup 2	Dup 1	Dup 2
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes							
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	2.11	2	11.62	3.66	3.9	2.03	2.26
ACETALDEHYDE	1.03	1.62	3.83	1.56	1.61	1.17	1.3
ACROLEIN	0.07	ND	0.06	ND	ND	ND	ND
ACETONE	1.47	8.07	4.88	3.72	4.02	2.2	2.5
PROPIONALDEHYDE	0.09	0.11	ND	0.2	0.21	0.15	0.17
CROTONALDEHYDE	ND	ND	0.58	0.15	0.16	ND	ND
BUTYR/ISOBUTYRALDEHYDE	0.63	0.86	0.88	0.23	0.24	0.13	0.15
BENZALDEHYDE	0.1	0.06	0.61	0.1	0.1	0.05	0.05
ISOVALERALDEHYDE	0.02	0.02	0.08	ND	ND	ND	ND
VALERALDERHYDE	0.05	0.04	0.81	0.06	0.06	0.03	0.04
TOLUALDEHYDES	0.04	0.17	0.13	0.06	0.06	0.02	0.03
HEXANALDEHYDE	0.04	ND	1.28	0.04	0.04	0.05	0.07

Date Sampled	***4/1/1999***	***4/21/1999***	***5/18/1999***	***5/30/1999***	***6/11/1999***	***6/23/1999***	***7/13/1999***
Location	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	Th	Wed	Tu	Su	Fr	We	Tu
Notes					creek fire		
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes							
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	2.03	1.55	1.79	2.22	3.38	2.52	1.74
ACETALDEHYDE	1.24	0.83	0.84	1.1	1.46	0.78	0.84
ACROLEIN	ND	ND	0.04	0.04	0.07	0.04	0.03
ACETONE	1.82	1.32	1.14	1.02	0.83	0.71	0.64
PROPIONALDEHYDE	0.15	0.11	0.08	0.12	0.15	0.1	0.07
CROTONALDEHYDE	ND	0.04	ND	ND	0.01	0	0.01
BUTYR/ISOBUTYRALDEHYDE	0.1	0.08	0.27	0.35	0.18	0.12	0.09
BENZALDEHYDE	0.06	0.05	0.05	0.06	0.11	0.08	0.04
ISOVALERALDEHYDE	0.021	ND	ND	0.028	0.03	0.01	0.01
VALERALDERHYDE	0.04	0.03	0.04	0.04	0.06	0.03	0.04
TOLUALDEHYDES	0.03	0	ND	0.05	0.06	0.04	0.03
HEXANALDEHYDE	0.03	0.03	0.03	0.04	0.05	0.03	0.03
Date Sampled	***7/23/1999***	***8/10/1999***	***8/10/1999***	***8/22/1999***	***9/16/1998***	***9/23/1998***	***10/2/1998***
Location	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Yew***	***Yew***	***Yew***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	Fr	Tu	Tu	Su	W	W	F
Notes		dup 1	dup 2				
sample start time (PST)	0	0	0	0	0	625	0
sample duration (minutes)	1440	1440	1440	1440	1440	1055	1440
Notes					Yew Fire Station	Yew Fire station	Yew Fire Station
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	2.35	2.4	3.07	2.06	2.22	2.73	0.94
ACETALDEHYDE	0.96	1.07	1.21	1.03	1.23	1.67	0.44
ACROLEIN	0.03	0.05	0.02	0.02	0.04	0.04	0.04
ACETONE	0.79	0.85	1.52	0.75	2.08	2.18	0.93
PROPIONALDEHYDE	0.09	0.11	0.12	0.11	0.13	0.16	0.05
CROTONALDEHYDE	0.01	0.01	0.01	0.01	ND	ND	ND
BUTYR/ISOBUTYRALDEHYDE	0.14	0.14	0.21	0.01	0.43	0.51	0.15
BENZALDEHYDE	0.06	0.08	0.13	0.06	0.08	0.12	0.04
ISOVALERALDEHYDE	0.01	0.02	0.02	0.02	0.01	ND	ND
VALERALDERHYDE	0.04	0.05	0.06	0.04	0.05	0.06	0.03
TOLUALDEHYDES	0.03	0.06	0.08	0.05	0.03	0.05	ND
HEXANALDEHYDE	0.04	0.05	0.08	0.05	0.05	0.05	0.03

Date Sampled	***10/15/1998***	***10/28/1998***	***11/19/1998***	***4/21/1999***	***5/18/1999***	***36310***	***36322***
Location	***Yew***	***Yew***	***Yew***	***Yew***	***Yew***	***Yew***	***Yew***
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of the Week	Th	W	Th	W	Tu	Su	Fr
Notes							
sample start time (PST)	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440
Notes	Yew Fire Station	Yew Fire Station	Yew Fire Station	Yew Fire Station	Yew Fire Station	Yew Fire Station	Mini Mall
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
FORMALDEHYDE	1.29	3.8	1.04	1.29	1.27	2.28	3.69
ACETALDEHYDE	0.87	2.92	0.63	0.67	ND	1.1	1.97
ACROLEIN	0.13	0.26	ND	ND	ND	0.07	0.07
ACETONE	1.22	0.86	0.91	0.92	ND	1.55	1.38
PROPIONALDEHYDE	0.08	0.06	0.05	0.12	0.94	0.13	0.23
CROTONALDEHYDE	ND	ND	ND	0.05	ND	ND	0.01
BUTYR/ISOBUTYRALDEHYDE	0.15	0.13	0.18	0.06	0.6	0.41	0.24
BENZALDEHYDE	0.05	0.03	0.03	0.04	0.06	0.09	0.16
ISOVALERALDEHYDE	ND	ND	0.02	ND	ND	0.05	0.03
VALERALDERHYDE	0.03	ND	0.03	0.03	ND	0.05	0.09
TOLUALDEHYDES	ND	ND	0.06	ND	ND	0.05	0.1
HEXANALDEHYDE	0.02	0.04	0.01	0.03	0.03	0.04	0.1
Date Sampled	***6/23/1999***	***7/13/1999***	***7/23/1999***	***8/10/1999***	***8/10/1999***	***8/22/1999***	
Location	***Yew***	***Yew***	***Yew***	***Yew***	***Yew***	***Yew***	
Carbonyl lab	ERG	ERG	ERG	ERG	ERG	ERG	
Day of the Week	W	Tu	Fr	Tu	Tu	Su	
Notes				Dup1	Dup 2		
sample start time (PST)	0	0	0	0	0	0	
sample duration (minutes)	1440	1440	1440	1440	1440	1440	
Notes	Mini Mall	Mini Mall	Mini Mall	Mini Mall	Mini Mall	Mini Mall	
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	
FORMALDEHYDE	2.34	2.16	2.21	2.99	3.19	2.56	
ACETALDEHYDE	1.28	1.14	1.30	1.55	1.59	1.31	
ACROLEIN	0.01	0.01	0.02	ND	ND	0.02	
ACETONE	0.74	0.81	1.00	1.12	1.15	1.15	
PROPIONALDEHYDE	0.13	0.13	0.13	0.17	0.16	0.17	
CROTONALDEHYDE	ND	0.01	ND	ND	ND	ND	
BUTYR/ISOBUTYRALDEHYDE	0.14	0.15	0.16	0.2	0.21	0.16	
BENZALDEHYDE	0.08	0.06	0.07	0.11	0.11	0.08	
ISOVALERALDEHYDE	0.01	0.01	0.02	0.03	0.03	0.02	
VALERALDERHYDE	0.05	0.06	0.07	0.08	0.08	0.07	
TOLUALDEHYDES	0.04	0.02	0.03	0.07	0.08	0.06	
HEXANALDEHYDE	0.04	0.04	0.04	0.07	0.07	0.06	

Date Sampled				***8/13/1995***	***8/19/1995***	***8/25/1995***	***9/18/1995***	***9/18/1995***	***9/30/1995***
Location				***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
VOC lab				ERG	ERG	ERG	ERG	ERG	ERG
Day of week				SU	SA	F	M	M	SA
Notes									
sample start time (PST)				0	0	0	0	0	0
sample duration (minutes)				1440	1440	1440	1440	1440	1440
Notes		ERG Lab-Cornwall Detection Limit					**dup 1**	**dup 2**	
Units	***CAS #***	mcg/m^3	***mol. wt.***	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	74-86-2	0.13	26.04	1.59	3.23	6.56	5.40	5.31	3.35
CHLOROMETHANE	74-87-3	0.81	50.49	0.50	0.59	0.54	0.65	0.51	
VINYL CHLORIDE	75-01-4	0.28	62.50						
BROMOMETHANE	74-83-9	0.70	94.95						
CHLOROETHANE	75-00-3	0.47	64.52						
1,1-DICHLOROETHENE	75-34-4		96.94						
METHYLENE CHLORIDE	75-09-2	0.56	84.93	2.86	5.71	3.93	10.19	13.57	1.36
1,1 - DICHLOROETHANE	75-35-3	0.24	98.96						
CIS-1,2-DICHLOROETHENE	540-59-0		96.94						
CHLOROFORM	67-66-3	0.29	119.38	0.53	0.47	0.57	0.12	0.12	0.19
1,1,1 - TRICHLOROETHANE	71-55-6	1.80	133.41	0.41	0.37		0.48	0.45	
CARBON TETRACHLORIDE	56-23-5	0.44	153.82	0.07	0.08	0.07			
BENZENE	71-43-2	0.77	78.12	0.24	0.62	0.81	0.73	0.70	0.35
1,2 - DICHLOROETHANE	107-06-2	1.05	99.00						
TRICHLOROETHYLENE	79-01-6	0.27	131.40						
1,2 - DICHLOROPROPANE	78-87-5	0.18	112.99						
cis - 1,3 - DICHLOROPROPENE	542-75-6	0.23	110.98						
TOLUENE	108-88-3	0.15	92.15	1.58	2.17	3.32	2.70	2.67	1.07
trans - 1,3 - DICHLOROPROPENE	*542-75-6*	0.36	110.98						
1,1,2 - TRICHLOROETHANE	79-00-5	0.27	133.42						
TETRACHLOROETHYLENE	127-18-4	0.20	165.83			0.04			
ETHYLENE DIBROMIDE	106-93-4		187.88						
CHLOROBENZENE	108-90-7	0.28	112.56						
ETHYLBENZENE	100-41-4	0.35	104.16	0.29	0.61	0.9	0.61	0.60	0.22
m,p - XYLENE	1330-20-7	0.48	106.17	1.49	3.25	4.63	3.28	3.24	1.16
o - XYLENE	1330-20-7	0.26	106.17	0.59	1.27	1.84	1.35	1.34	0.46
STYRENE	100-42-5	0.34	104.14		0.10	0.17	0.11	0.11	
1,1,2,2 - TETRACHLOROETHANE	79-34-5	1.10	167.85				1.00		
1,3,5 TRIMETHYLBENZENE	108-67-8		120.19						
1,2,4 TRIMETHYLBENZENE	95-63-6		120.19						
m -(1,3)- DICHLOROBENZENE	541-73-1	0.42	147.01						
p -(1,4)- DICHLOROBENZENE	106-46-7	0.36	147.01						
CHLOROTOLUENE	95-49-8		126.58						
o -(1,2)- DICHLOROBENZENE	95-50-1	0.48	147.01						
1,2,4-TRICHLOROBENZENE	120-82-1		181.46						
HEXACHLOROBUTADIENE	87-68-3		260.76						
PROPYLENE	115-07-1	0.15	42.08	0.19	0.78	1.13	1.09	1.07	0.55
1,3-BUTADIENE	106-99-0	0.33	54.09						
ACETONE	67-64-1		58.08						
CARBON DISULFIDE	75-15-0		76.14						
2-PROPANOL	67-63-0		60.1						
trans - 1,2 - DICHLOROETHYLENE	540-59-0	0.87	96.94						
VINYL ACETATE	108-05-4		86.09						
CHLOROPRENE	126-99-8	0.18	88.54						
2-BUTANONE (MEK)	78-93-3		72.11						
HEXANE	100-54-3		86.18						
TETRAHYDROFURAN	109-99-9		72.11						
CYCLOHEXANE	110-82-7		84.16						
1,4 DIOXANE	123-91-1		88.11						
BROMODICHLOROMETHANE	75-27-4	0.60	163.83						
4-METHYL-2-PENTANONE	108-10-1		100.16						
2-HEXANONE	591-78-6		100.16						
DIBROMOCHLOROMETHANE	124-48-1	0.43	208.29						
BROMOFORM	75-25-2	0.83	252.77						
4-ETHYLTOLUENE	622-96-8		120.2						
ETHANOL	64-17-5		46.07						
METHYL TERT-BUTYL ETHER	1634-04-4		88.15						
HEPTANE	142-82-5		100.21						
BROMOCHLOROMETHANE	74-97-5	0.37	129.39						
N-OCTANE	111-65-9	0.23	114.23	0.80	2.03	2.73	1.78	1.74	0.50

Date Sampled	***10/24/1995***	***11/5/1995***	***11/17/1995***	***11/29/1995***	***12/11/1995***	***12/11/1995***	***12/23/1995***	***1/22/1996***	***1/28/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
VOC lab	ERG	ERG	ERG		ERG	ERG	ERG	ERG	ERG
Day of week	TU	SU	F	W	M	M	SA	M	SU
Notes									
sample start time (PST)	0	0	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes					**dup 1**	**dup 2**			
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	10.04	2.30	3.63	2.20	9.03	9.79	21.29	8.67	5.02
CHLOROMETHANE	0.88	0.70	0.86	0.56		0.50		0.65	0.73
VINYL CHLORIDE									
BROMOMETHANE									
CHLOROETHANE									
1,1-DICHLOROETHENE									
METHYLENE CHLORIDE	12.39	1.23	3.85	3.06	4.28	4.43	4.48	3.47	4.40
1,1 - DICHLOROETHANE									
CIS-1,2-DICHLOROETHENE									
CHLOROFORM			0.09				0.27		0.07
1,1,1 - TRICHLOROETHANE							0.33	0.40	
CARBON TETRACHLORIDE	0.08	0.08	0.11				0.07	0.12	0.08
BENZENE	1.57	0.31	0.78	0.28	1.11	1.11	1.98	1.35	0.62
1,2 - DICHLOROETHANE									
TRICHLOROETHYLENE							0.05		
1,2 - DICHLOROPROPANE									
cis - 1,3 - DICHLOROPROPENE									
TOLUENE	3.63	0.97	2.88	1.09	3.01	3.01	6.56	2.79	2.42
trans - 1,3 - DICHLOROPROPENE									
1,1,2 - TRICHLOROETHANE									
TETRACHLOROETHYLENE	0.28		0.14	0.03	0.08	0.08		0.23	
ETHYLENE DIBROMIDE									
CHLOROBENZENE									
ETHYLBENZENE	0.53	0.21	0.58	0.33	0.61	0.58	2.01	0.48	0.39
m,p - XYLENE	2.55	1.09	2.93	1.29	3.19	2.98	7.74	2.58	2.03
o - XYLENE	0.99	0.45		0.55	1.27	1.17	3.38	1.00	0.78
STYRENE	0.12				0.13	0.12	1.40	0.11	0.08
1,1,2,2 - TETRACHLOROETHANE									
1,3,5 TRIMETHYLBENZENE									
1,2,4 TRIMETHYLBENZENE									
m -(1,3)- DICHLOROBENZENE									
p -(1,4)- DICHLOROBENZENE									
CHLOROTOLUENE									
o -(1,2)- DICHLOROBENZENE									
1,2,4-TRICHLOROBENZENE									
HEXACHLOROBUTADIENE									
PROPYLENE	2.62	0.69	1.12	0.40	1.72	1.64	3.35	1.13	0.68
1,3-BUTADIENE	0.18						0.32		
ACETONE									
CARBON DISULFIDE									
2-PROPANOL									
trans - 1,2 - DICHLOROETHYLENE									
VINYL ACETATE									
CHLOROPRENE									
2-BUTANONE (MEK)									
HEXANE									
TETRAHYDROFURAN									
CYCLOHEXANE									
1,4 DIOXANE									
BROMODICHLOROMETHANE									
4-METHYL-2-PENTANONE									
2-HEXANONE									
DIBROMOCHLOROMETHANE									
BROMOFORM									
4-ETHYLTOLUENE									
ETHANOL									
METHYL TERT-BUTYL ETHER									
HEPTANE									
BROMOCHLOROMETHANE									
N-OCTANE	0.53	0.62	1.47	0.72	1.27	1.17	1.50	0.86	1.00

Date Sampled	***2/9/1996***	***2/21/1996***	***3/28/1996***	***3/28/1996***	***4/9/1996***	***4/23/1996***	***5/3/1996***	***5/15/1996***	***5/27/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
VOC lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of week	F	W	TH	TH	TU	TU	F	W	M
Notes									
sample start time (PST)	0	0	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes			**dup 1**	**dup 2**					
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	8.75	11.04	5.27	5.44	6.35	3.83	4.41	4.90	6.38
CHLOROMETHANE	0.65	0.69		0.50	0.61	0.57	0.59	1.11	1.45
VINYL CHLORIDE									
BROMOMETHANE									
CHLOROETHANE									
1,1-DICHLOROETHENE									
METHYLENE CHLORIDE	3.23	4.51	7.28	6.98	8.60	5.98	3.09	10.44	49.47
1,1 - DICHLOROETHANE									
CIS-1,2-DICHLOROETHENE									
CHLOROFORM	1.57	0.14			0.28		0.32	0.53	3.77
1,1,1 - TRICHLOROETHANE									0.95
CARBON TETRACHLORIDE	0.08	0.08			0.07	0.09	0.07	0.12	0.22
BENZENE	1.35	1.35	0.51	0.62	0.80	0.58	0.63	0.95	2.18
1,2 - DICHLOROETHANE									
TRICHLOROETHYLENE									
1,2 - DICHLOROPROPANE									
cis - 1,3 - DICHLOROPROPENE									
TOLUENE	3.38	3.79	1.70	1.77	2.78	1.96	2.00	2.54	56.02
trans - 1,3 - DICHLOROPROPENE									
1,1,2 - TRICHLOROETHANE									
TETRACHLOROETHYLENE		0.14			0.14	0.11	0.03	0.04	0.04
ETHYLENE DIBROMIDE									
CHLOROBENZENE									1.17
ETHYLBENZENE	0.61	0.77	0.42	0.42	0.62	0.50	0.47	0.72	3.16
m,p - XYLENE	3.28	3.96	2.27	2.38	3.42	2.77	2.57	4.98	15.57
o - XYLENE	1.30	1.58	0.92	0.95	1.35	1.11	1.01	1.66	5.00
STYRENE	0.15	0.22	0.04	0.05	0.11	0.08			0.22
1,1,2,2 - TETRACHLOROETHANE									
1,3,5 TRIMETHYLBENZENE									
1,2,4 TRIMETHYLBENZENE									
m -(1,3)- DICHLOROBENZENE									
p -(1,4)- DICHLOROBENZENE									0.09
CHLOROTOLUENE									
o -(1,2)- DICHLOROBENZENE									
1,2,4-TRICHLOROBENZENE									
HEXACHLOROBUTADIENE									
PROPYLENE	1.69	1.58	0.74	0.72	1.01	0.50	0.71	0.89	2.06
1,3-BUTADIENE	0.20	0.16							
ACETONE									
CARBON DISULFIDE									
2-PROPANOL									
trans - 1,2 - DICHLOROETHYLENE									
VINYL ACETATE									
CHLOROPRENE									
2-BUTANONE (MEK)									
HEXANE									
TETRAHYDROFURAN									
CYCLOHEXANE									
1,4 DIOXANE									
BROMODICHLOROMETHANE									
4-METHYL-2-PENTANONE									
2-HEXANONE									
DIBROMOCHLOROMETHANE									
BROMOFORM									
4-ETHYLTOLUENE									
ETHANOL									
METHYL TERT-BUTYL ETHER									
HEPTANE									
BROMOCHLOROMETHANE									
N-OCTANE	1.04	1.70	1.46	1.46	1.80	1.81	1.54	2.44	11.09

Date Sampled	***7/20/1996***	***7/26/1996***	***8/8/1996***	***8/19/1996***	***8/31/1996***	***9/12/1996***	***9/12/1996***	***9/24/1996***	***10/6/1996***
Location	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***	***cornwall***
VOC lab	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Day of week	SA	F	TH	M	SA	TH	TH	TU	SU
Notes									
sample start time (PST)	0	0	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes						**dup 1**	**dup 2**		
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	2.03	3.25	4.44	2.00	2.01	2.17	2.07	5.59	4.03
CHLOROMETHANE	1.06	0.72	0.69	0.54	0.56	0.55	0.46		0.52
VINYL CHLORIDE									
BROMOMETHANE									
CHLOROETHANE									
1,1-DICHLOROETHENE									
METHYLENE CHLORIDE	13.34	12.15	9.63	8.07	17.87	15.07	14.17	16.05	9.05
1,1 - DICHLOROETHANE									
CIS-1,2-DICHLOROETHENE									
CHLOROFORM	1.57	1.60	2.21	0.08	0.34	0.17	0.17	0.29	1.49
1,1,1 - TRICHLOROETHANE			0.41	0.47	0.49	0.39	0.41	0.50	0.36
CARBON TETRACHLORIDE	0.15	0.11	0.10	0.10	0.08	0.07	0.08	0.07	0.08
BENZENE	1.29	1.02	1.55	0.63	0.70	0.71	0.84	1.95	1.84
1,2 - DICHLOROETHANE									
TRICHLOROETHYLENE			0.94						
1,2 - DICHLOROPROPANE									
cis - 1,3 - DICHLOROPROPENE									
TOLUENE	4.73	4.20	13.38	2.89	3.20	3.78	3.75	6.15	5.51
trans - 1,3 - DICHLOROPROPENE									
1,1,2 - TRICHLOROETHANE									
TETRACHLOROETHYLENE	0.05		0.19	0.06	0.03	0.06	0.05		0.03
ETHYLENE DIBROMIDE									
CHLOROBENZENE									
ETHYLBENZENE	0.54	0.89	1.25	0.72	0.74	0.93	0.89	1.15	0.87
m,p - XYLENE	4.49	4.12	4.90	3.06	3.19	3.65	3.64	4.69	3.43
o - XYLENE	1.66	1.47	1.70	1.07	1.16	1.31	1.29	1.67	1.22
STYRENE	0.71	2.93	7.64	0.79	0.93	1.21	1.00	1.93	1.36
1,1,2,2 - TETRACHLOROETHANE									
1,3,5 TRIMETHYLBENZENE									
1,2,4 TRIMETHYLBENZENE									
m -(1,3)- DICHLOROBENZENE									0.07
p -(1,4)- DICHLOROBENZENE									
CHLOROTOLUENE									
o -(1,2)- DICHLOROBENZENE									
1,2,4-TRICHLOROBENZENE									
HEXACHLOROBUTADIENE									
PROPYLENE	0.64	1.17	1.23	0.70	0.64	0.75	0.70	1.62	1.39
1,3-BUTADIENE						0.07	0.07		
ACETONE									
CARBON DISULFIDE									
2-PROPANOL									
trans - 1,2 - DICHLOROETHYLENE									
VINYL ACETATE									
CHLOROPRENE									
2-BUTANONE (MEK)									
HEXANE									
TETRAHYDROFURAN									
CYCLOHEXANE									
1,4 DIOXANE									
BROMODICHLOROMETHANE									
4-METHYL-2-PENTANONE									
2-HEXANONE									
DIBROMOCHLOROMETHANE									
BROMOFORM									
4-ETHYLTOLUENE									
ETHANOL									
METHYL TERT-BUTYL ETHER									
HEPTANE									
BROMOCHLOROMETHANE									
N-OCTANE	4.03	3.12	5.02	2.90	2.80	3.05	3.02	3.36	2.42

Date Sampled	***10/18/1996***	***10/30/1996***	***9/8/1997***	***8/18/1997***	***9/2/1997***	***9/9/1997***	***9/23/1997***	***10/7/1997***	***10/13/1997***
Location	***cornwall***	***cornwall***	***GRAB***	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***	***RR Ave***
VOC lab	ERG	ERG	ATL	ATL	ATL	ATL	ATL	ATL	ATL
Day of week	F	W	M	M	TU	TU	TU	TU	M
Notes			Targeted	Targeted	Targeted	Targeted	Targeted	Targeted	Targeted
sample start time (PST)	0	0	1700	1625	950	1530	1510	1210	1505
sample duration (minutes)	1440	1440	60	1440	1440	1440	1440	1440	1440
Notes									
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	7.41	19.66	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	0.54	0.57	0.69	ND0.62	0.86	0.66	0.58	0.48	0.58
VINYL CHLORIDE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
BROMOMETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
CHLOROETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
1,1-DICHLOROETHENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
METHYLENE CHLORIDE	7.67	10.20	0.83	ND3.1	ND0.50	ND0.10	0.33	0.14	0.19
1,1 - DICHLOROETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
CIS-1,2-DICHLOROETHENE			ND0.15	ND0.62	0.22	ND0.10	ND0.10	ND0.10	ND0.10
CHLOROFORM	0.06		0.4	ND0.62	1.6	0.18	0.95	ND0.10	1.3
1,1,1 - TRICHLOROETHANE		0.34	ND0.15	ND0.62	0.15	0.14	0.14	0.11	0.11
CARBON TETRACHLORIDE	0.10	0.07	ND0.15	ND0.62	0.14	0.13	0.12	0.1	ND0.10
BENZENE	0.82	2.13	3.3	1.1	1.5	2.2	2.9	0.83	1.7
1,2 - DICHLOROETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
TRICHLOROETHYLENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
1,2 - DICHLOROPROPANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
cis - 1,3 - DICHLOROPROPENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
TOLUENE	1.32	6.03	6.4	3.5	5.4	5.5	7.3	2.3	3.7
trans - 1,3 - DICHLOROPROPENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
1,1,2 - TRICHLOROETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
TETRACHLOROETHYLENE	0.04	0.03	ND0.15	ND0.62	ND0.10	0.23	0.12	0.17	ND0.10
ETHYLENE DIBROMIDE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
CHLOROBENZENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
ETHYLBENZENE	0.10	1.70	0.39	ND0.62	0.80	0.72	1.0	0.27	0.42
m,p - XYLENE	0.26	7.97	1.2	1.2	3.1	2.8	4.2	1.0	1.2
o - XYLENE	0.07	2.77	0.41	ND0.62	1.2	1.1	1.5	0.38	0.42
STYRENE		0.24	ND0.15	0.81	ND0.10	0.32	ND0.10	0.13	0.22
1,1,2,2 - TETRACHLOROETHANE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
1,3,5 TRIMETHYLBENZENE			0.17	ND0.62	0.53	0.44	0.6	0.14	0.60
1,2,4 TRIMETHYLBENZENE			0.57	1.1	2.6	1.8	2.4	0.51	0.60
m -(1,3)- DICHLOROBENZENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
p -(1,4)- DICHLOROBENZENE			0.41	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
CHLOROTOLUENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
o -(1,2)- DICHLOROBENZENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
1,2,4-TRICHLOROBENZENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
HEXACHLOROBUTADIENE			ND0.15	ND0.62	ND0.10	ND0.10	ND0.10	ND0.10	ND0.10
PROPYLENE	1.24	3.26	ND0.76	ND3.1	ND0.50	3.8	ND0.50	ND0.50	ND0.50
1,3-BUTADIENE		0.28	ND0.76	ND3.1	ND0.50	ND0.50	0.58	ND0.50	ND0.50
ACETONE			15	11	12	12	11	6.6	8.3
CARBON DISULFIDE			1.1	ND3.1	2.3	1.5	2.3	1.1	1.1
2-PROPANOL			13	ND3.1	2.4	2.0	2.2	0.84	1.3
trans - 1,2 - DICHLOROETHYLENE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
VINYL ACETATE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
CHLOROPRENE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
2-BUTANONE (MEK)			2.0	ND3.1	1.6	1.4	1.5	0.80	1.8
HEXANE			2.9	ND3.1	0.83	1.4	1.8	ND0.50	0.92
TETRAHYDROFURAN			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	0.54
CYCLOHEXANE			ND0.76	ND03.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
1,4 DIOXANE			5.4	ND3.1	1.4	1.1	1.6	ND0.50	ND0.50
BROMODICHLOROMETHANE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
4-METHYL-2-PENTANONE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
2-HEXANONE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
DIBROMOCHLOROMETHANE			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
BROMOFORM			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
4-ETHYLTOLUENE			ND0.76	ND3.1	1.6	1.3	1.8	ND0.50	ND0.50
ETHANOL			120	15	14	24	28	13	10
METHYL TERT-BUTYL ETHER			ND0.76	ND3.1	ND0.50	ND0.50	ND0.50	ND0.50	ND0.50
HEPTANE			ND0.76	ND3.1	0.92	0.67	0.78	ND0.50	0.54
BROMOCHLOROMETHANE			NA	NA	NA	NA	NA	NA	NA
N-OCTANE	0.09	2.51	NA	NA	NA	NA	NA	NA	NA

Date Sampled	***10/16/1997***	***11/12/1997***	***11/13/1997***	***12/2/1997***	***12/4/1997***	***12/30/1997***	***2/5/1998***	***2/18/1998***	***2/28/1998***
Location	***RR Ave***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***
VOC lab	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL
Day of week	TH	W	TH	TU	TH	TU	TH	W	SA
Notes	Targeted	Targeted	Targeted						
sample start time (PST)	1505	1145	1225	1351	1205	1145	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes									
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	0.69	0.68	1.0	0.58	0.58	ND0.12	0.85	0.83	0.48
VINYL CHLORIDE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
BROMOMETHANE	ND0.33	0.33	0.33	ND0.22	0.28	ND0.12	0.52	0.93	ND0.11
CHLOROETHANE	ND0.33	ND0.11	0.18	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,1-DICHLOROETHENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
METHYLENE CHLORIDE	0.42	0.46	0.47	1.9	1.8	1.3	NA	0.55	NA
1,1 - DICHLOROETHANE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
CIS-1,2-DICHLOROETHENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
CHLOROFORM	1.6	2.5	2.1	0.52	0.47	ND0.12	ND0.33	ND0.10	ND0.11
1,1,1 - TRICHLOROETHANE	ND0.33	0.13	ND0.13	ND0.22	0.13	ND0.12	ND0.33	0.10	0.11
CARBON TETRACHLORIDE	ND0.33	ND0.11	ND0.13	ND0.22	0.12	ND0.12	ND0.33	0.11	0.12
BENZENE	1.6	3.0	4.3	3.2	2.5	2.2	1.8	0.66	1.4
1,2 - DICHLOROETHANE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
TRICHLOROETHYLENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,2 - DICHLOROPROPANE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
cis - 1,3 - DICHLOROPROPENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
TOLUENE	3.5	6.3	8.6	6.4	5.8	4.8	3.3	2.00	2.5
trans - 1,3 - DICHLOROPROPENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,1,2 - TRICHLOROETHANE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
TETRACHLOROETHYLENE	ND0.33	ND0.11	ND0.13	ND0.22	0.12	0.32	ND0.33	ND0.10	0.14
ETHYLENE DIBROMIDE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
CHLOROBENZENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
ETHYLBENZENE	0.48	0.92	1.3	1.0	0.83	0.68	0.49	0.21	0.27
m,p - XYLENE	1.8	3.8	5.6	4.0	3.4	2.5	1.7	0.76	1
o - XYLENE	0.68	1.4	2.2	1.5	1.3	0.95	0.69	0.26	0.37
STYRENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,1,2,2 - TETRACHLOROETHANE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,3,5 TRIMETHYLBENZENE	ND0.33	0.62	0.86	0.47	0.5	0.30	ND0.33	ND0.10	0.12
1,2,4 TRIMETHYLBENZENE	0.96	2.3	3.4	1.6	1.7	1.3	0.82	0.54	0.49
m -(1,3)- DICHLOROBENZENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
p -(1,4)- DICHLOROBENZENE	ND0.33	0.26	0.23	0.25	0.24	0.45	0.56	0.45	0.38
CHLOROTOLUENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
o -(1,2)- DICHLOROBENZENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
1,2,4-TRICHLOROBENZENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
HEXACHLOROBUTADIENE	ND0.33	ND0.11	ND0.13	ND0.22	ND0.11	ND0.12	ND0.33	ND0.10	ND0.11
PROPYLENE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.11	ND0.59	ND1.6	ND0.50	ND0.53
1,3-BUTADIENE	ND1.7	ND0.57	0.71	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
ACETONE	7.2	4.0	9.6	6.1	2.3	7.2	6.6	5.70	3.7
CARBON DISULFIDE	ND1.7	0.77	ND0.64	1.9	ND0.57	3.3	ND1.6	1.90	0.56
2-PROPANOL	3.7	0.83	1.5	4.7	ND0.57	2.8	2.9	3.60	0.99
trans - 1,2 - DICHLOROETHYLENE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
VINYL ACETATE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
CHLOROPRENE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
2-BUTANONE (MEK)	ND1.7	0.79	1.3	ND1.1	0.76	0.81	ND1.6	0.57	ND0.53
HEXANE	ND1.7	1.1	1.9	1.9	1.2	1.2	ND1.6	ND0.50	ND0.53
TETRAHYDROFURAN	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	0.87	ND0.53
CYCLOHEXANE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	1.9
1,4 DIOXANE	ND1.7	ND0.57	1.0	1.9	ND0.57	2.2	2.2	2.40	1.4
BROMODICHLOROMETHANE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
4-METHYL-2-PENTANONE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
2-HEXANONE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
DIBROMOCHLOROMETHANE	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
BROMOFORM	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
4-ETHYLTOLUENE	ND1.7	1.3	2	1.4	1.2	0.85	ND1.6	ND0.50	ND0.53
ETHANOL	14	11	20	14	9.3	27	8.1	7.50	36
METHYL TERT-BUTYL ETHER	ND1.7	ND0.57	ND0.64	ND1.1	ND0.57	ND0.59	ND1.6	ND0.50	ND0.53
HEPTANE	ND1.7	0.75	1.3	ND1.1	0.77	ND0.59	ND1.6	ND0.50	ND0.53
BROMOCHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-OCTANE	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	3/4/1998	3/18/1998	3/30/1998	4/11/1998	4/23/1998	5/17/1998	5/29/1998	6/25/1998	7/8/1998
Location	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.	Bay St.
VOC lab	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL
Day of week	W	W	M	SA	TH	SU	F	TH	W
Notes	Targeted								
sample start time (PST)	0	0	0	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes									
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	0.48	0.58	ND0.18	ND0.17	0.45	0.75	0.83	0.61	0.94
VINYL CHLORIDE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
BROMOMETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	0.22	0.46	0.13	0.59
CHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,1-DICHLOROETHENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
METHYLENE CHLORIDE	NA	2.1	1.3	0.56	2.8	0.19	3	0.18	0.47
1,1 - DICHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
CIS-1,2-DICHLOROETHENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
CHLOROFORM	ND0.11	0.34	ND0.18	0.18	N0.12	0.33	0.41	0.46	0.59
1,1,1 - TRICHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
CARBON TETRACHLORIDE	0.12	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
BENZENE	1.4	1	1	0.69	1.4	0.42	0.94	0.41	0.95
1,2 - DICHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
TRICHLOROETHYLENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,2 - DICHLOROPROPANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
cis - 1,3 - DICHLOROPROPENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
TOLUENE	3.5	1.8	3.9	0.85	3.1	0.64	2.1	0.81	1.9
trans - 1,3 - DICHLOROPROPENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,1,2 - TRICHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
TETRACHLOROETHYLENE	0.16	ND0.14	2.3	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
ETHYLENE DIBROMIDE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
CHLOROBENZENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
ETHYLBENZENE	0.35	0.24	0.3	ND0.17	0.32	ND0.12	0.27	ND0.12	0.21
m,p - XYLENE	1.4	1	1.2	ND0.17	1.3	0.16	1	0.3	0.87
o - XYLENE	0.49	0.35	0.35	ND0.17	0.44	ND0.12	0.4	ND0.12	0.36
STYRENE	0.25	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,1,2,2 - TETRACHLOROETHANE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,3,5 TRIMETHYLBENZENE	0.12	0.16	0.18	ND0.17	0.16	ND0.12	0.13	ND0.12	ND0.13
1,2,4 TRIMETHYLBENZENE	0.43	0.54	0.71	ND0.17	0.67	ND0.12	0.46	ND0.12	0.46
m -(1,3)- DICHLOROBENZENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
p -(1,4)- DICHLOROBENZENE	0.26	0.36	0.18	ND0.17	0.45	ND0.12	0.45	ND0.12	0.18
CHLOROTOLUENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
o -(1,2)- DICHLOROBENZENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
1,2,4-TRICHLOROBENZENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
HEXACHLOROBUTADIENE	ND0.11	ND0.14	ND0.18	ND0.17	N0.12	ND0.12	ND0.12	ND0.12	ND0.13
PROPYLENE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
1,3-BUTADIENE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
ACETONE	7.6	6.7	12	4.9	6.9	3.8	9.2	2.9	4.7
CARBON DISULFIDE	ND0.53	0.78	ND0.88	ND0.84	1.3	0.68	0.79	1	2.2
2-PROPANOL	0.93	2	4.4	1.5	2.6	1.6	1.3	ND0.61	1.1
trans - 1,2 - DICHLOROETHYLENE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
VINYL ACETATE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
CHLOROPRENE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	NA	NA	NA
2-BUTANONE (MEK)	1.7	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	0.83	ND0.61	0.82
HEXANE	ND0.53	0.94	ND0.88	ND0.84	0.72	ND0.60	0.72	ND0.61	0.66
TETRAHYDROFURAN	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
CYCLOHEXANE	ND0.53	2.1	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
1,4 DIOXANE	0.94	1	1.6	ND0.84	N0.6	2.1	5.1	ND0.61	0.95
BROMODICHLOROMETHANE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
4-METHYL-2-PENTANONE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
2-HEXANONE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
DIBROMOCHLOROMETHANE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
BROMOFORM	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
4-ETHYLTOLUENE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
ETHANOL	19	30	14	12	16	12	20	9	9.1
METHYL TERT-BUTYL ETHER	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
HEPTANE	ND0.53	ND0.70	ND0.88	ND0.84	N0.6	ND0.60	ND0.60	ND0.61	ND0.63
BROMOCHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-OCTANE	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	***7/17/1998***	***7/30/1998***	***9/1/1998***	***9/23/1998***	***10/2/1998***	***10/15/1998***	***10/28/1998***	***11/19/1998***	***1/27/1999***
Location	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***
VOC lab	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL
Day of week	F	TH	W	W	F	TH	W	TH	W
Notes	Targeted								Dup 1
sample start time (PST)	0	0	1530	0	0	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes									Bay Sampler
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	1.2	0.51	0.9	0.52	0.49	0.37	ND0.1	ND0.1	0.69
VINYL CHLORIDE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	ND0.1
BROMOMETHANE	ND0.13	0.15	0.21	0.19	ND0.12	0.17	ND0.1	ND0.1	0.13
CHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
1,1-DICHLOROETHENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
METHYLENE CHLORIDE	0.25	0.21	0.25	1.6	0.23	0.23	0.3	1.3	4.4
1,1 - DICHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
CIS-1,2-DICHLOROETHENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
CHLOROFORM	0.81	1.3	0.91	ND0.12	ND0.12	0.21	0.39	ND0.1	N0.1
1,1,1 - TRICHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	0.35	N0.1
CARBON TETRACHLORIDE	ND0.13	ND0.13	0.17	ND0.12	0.62	ND0.1	ND0.1	ND0.1	N0.1
BENZENE	0.56	0.44	0.7	2.4	0	0.84	0.72	0.62	0.52
1,2 - DICHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
TRICHLOROETHYLENE	0.21	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
1,2 - DICHLOROPROPANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
cis - 1,3 - DICHLOROPROPENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
TOLUENE	1.4	1.5	1.6	4.8	1.4	1.7	1.6	1.1	1.2
trans - 1,3 - DICHLOROPROPENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
1,1,2 - TRICHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
TETRACHLOROETHYLENE	ND0.13	ND0.13	ND0.13	0.13	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
ETHYLENE DIBROMIDE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
CHLOROBENZENE	ND0.13	ND0.13	ND0.13	0.13	ND0.12	ND0.1	ND0.1	ND0.1	0.12
ETHYLBENZENE	0.16	ND0.13	0.2	0.56	0.18	0.25	0.2	0.16	0.22
m,p - XYLENE	0.65	0.18	0.89	1.9	0.69	0.96	0.68	0.54	1.1
o - XYLENE	0.24	ND0.13	0.33	0.62	0.25	0.34	0.2	0.17	0.48
STYRENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	0.14
1,1,2,2 - TETRACHLOROETHANE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
1,3,5 TRIMETHYLBENZENE	ND0.13	ND0.13	ND0.13	0.13	ND0.12	0.13	0.11	0.18	0.22
1,2,4 TRIMETHYLBENZENE	0.33	ND0.13	0.31	0.27	0.63	0.67	0.36	0.38	0.62
m -(1,3)- DICHLOROBENZENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
p -(1,4)- DICHLOROBENZENE	0.24	ND0.13	0.15	ND0.12	0.2	0.35	0.18	0.35	0.39
CHLOROTOLUENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
o -(1,2)- DICHLOROBENZENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	0.44
1,2,4-TRICHLOROBENZENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
HEXACHLOROBUTADIENE	ND0.13	ND0.13	ND0.13	ND0.12	ND0.12	ND0.1	ND0.1	ND0.1	N0.1
PROPYLENE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
1,3-BUTADIENE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
ACETONE	8.2	5.2	11	9.4	3.8	3.7	ND0.5	2.3	0.93
CARBON DISULFIDE	3.1	1.9	4.7	3.3	1.3	0.71	3.7	ND0.5	N0.5
2-PROPANOL	1.3	0.99	0.91	7.3	0.96	1.4	1.7	4.8	6.2
trans - 1,2 - DICHLOROETHYLENE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
VINYL ACETATE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
CHLOROPRENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-BUTANONE (MEK)	2.6	ND0.63	1.1	1.1	ND0.61	ND0.5	ND0.5	0.73	0.28
HEXANE	ND0.63	ND0.63	ND0.64	1.6	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
TETRAHYDROFURAN	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
CYCLOHEXANE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
1,4 DIOXANE	0.87	1.9	ND0.64	ND0.59	ND0.61	ND0.5	0.55	1.7	7.7
BROMODICHLOROMETHANE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
4-METHYL-2-PENTANONE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
2-HEXANONE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
DIBROMOCHLOROMETHANE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
BROMOFORM	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
4-ETHYLTOLUENE	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	0.59
ETHANOL	14	20	21	13	7.5	8.3	17	5.5	2.4
METHYL TERT-BUTYL ETHER	ND0.63	ND0.63	ND0.64	ND0.59	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
HEPTANE	ND0.63	ND0.63	ND0.64	0.95	ND0.61	ND0.5	ND0.5	ND0.5	N0.5
BROMOCHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-OCTANE	NA	NA	NA	NA	NA	NA	NA	NA	NA

Date Sampled	***1/27/1999***	***2/14/1999***	***2/14/1999***	***3/1/1999***	***3/1/1999***	***3/23/1999***	***4/1/1999***	***4/21/1999***	***5/18/1999***
Location	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***	***Bay St.***
VOC lab	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL
Day of week	W	SU	SU	M	M	TU	TH	W	TU
Notes	Dup 2	Dup 1	Dup 2	Dup 1	Dup 2	targeted			
sample start time (PST)	0	1101	1121	1620	1630	0	0	0	0
sample duration (minutes)	1440	1440	1440	1440	1440	1440	1440	1440	1440
Notes	Yew Sampler	Targeted Bay Sampler	Targeted 24 hr. mech sampler	Targeted Bay Sampler	Targeted 24 hr. mech sampler				
Units	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
ACETYLENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROMETHANE	4.2	1	1	0.86	0.83	0.64	0.78	1.2	N0.1
VINYL CHLORIDE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
BROMOMETHANE	0.56	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
CHLOROETHANE	0.56	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
1,1-DICHLOROETHENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
METHYLENE CHLORIDE	12	0.12	0.37	4	1.5	0.46	1.1B	0.48	0.22
1,1 - DICHLOROETHANE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
CIS-1,2-DICHLOROETHENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
CHLOROFORM	0.2	0.45	0.4	N0.1	N0.19	0.11	0.42	0.79	0.17
1,1,1 - TRICHLOROETHANE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
CARBON TETRACHLORIDE	N0.2	N0.1	N0.2	0.16	N0.19	0.12	0.13	0.17	N0.1
BENZENE	1.2	0.92	0.92	1.4	1.1	0.96	1	0.65	0.46
1,2 - DICHLOROETHANE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
TRICHLOROETHYLENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
1,2 - DICHLOROPROPANE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
cis - 1,3 - DICHLOROPROPENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
TOLUENE	1.9	1.8	1.6	2.8	1.8	1.3	1.3	1.5	0.83
trans - 1,3 - DICHLOROPROPENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
1,1,2 - TRICHLOROETHANE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
TETRACHLOROETHYLENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	0.13	N0.1	N0.1
ETHYLENE DIBROMIDE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
CHLOROBENZENE	0.44	N0.1	0.32	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
ETHYLBENZENE	0.23	0.21	0.29	0.26	0.38	0.2	0.11	0.19	N0.1
m,p - XYLENE	0.83	0.75	0.93	0.64	0.96	0.69	0.41	0.73	0.33
o - XYLENE	0.25	0.29	0.36	0.2	0.36	0.26	0.14	0.25	0.12
STYRENE	N0.2	0.11	0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
1,1,2,2 - TETRACHLOROETHANE	N0.2	N0.1	N0.2	N0.1	N0.19	0.13	N0.1	N0.1	N0.1
1,3,5 TRIMETHYLBENZENE	N0.2	0.17	N0.2	N0.1	N0.19	0.17	N0.1	0.13	N0.1
1,2,4 TRIMETHYLBENZENE	0.36	0.62	0.47	N0.1	0.22	0.37	0.13	0.36	0.18
m -(1,3)- DICHLOROBENZENE	N0.2	N0.1	N0.2	N0.1	N0.19	0.17	N0.1	N0.1	N0.1
p -(1,4)- DICHLOROBENZENE	N0.2	0.33	N0.2	N0.1	N0.19	0.34	N0.1	0.43	0.3
CHLOROTOLUENE	N0.2	N0.1	N0.2	N0.1	N0.19	N0.1	N0.1	N0.1	N0.1
o -(1,2)- DICHLOROBENZENE	0.25	N0.1	N0.2	N0.1	N0.19	0.22	N0.1	N0.1	N0.1
1,2,4-TRICHLOROBENZENE	N0.2	N0.1	N0.2	N0.1	N0.19	0.39	N0.1	0.15	N0.1
HEXACHLOROBUTADIENE	N0.2	N0.1	N0.2	N0.1	N0.19	0.64	N0.1	0.24	N0.1
PROPYLENE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
1,3-BUTADIENE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
ACETONE	66	1.8	3.2	2.6	2.9	7.7	3.6B	2.1	5.5
CARBON DISULFIDE	2.2	0.52	N0.98	N0.5	N0.96	N0.5	0.77	N0.5	1.9
2-PROPANOL	24	2.9	2	2.2	N0.96	1.4	4.4	1.3	1.7
trans - 1,2 - DICHLOROETHYLENE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
VINYL ACETATE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
CHLOROPRENE	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-BUTANONE (MEK)	4	0.53	N0.98	0.66	N0.96	0.63	0.55	0.55	0.53
HEXANE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	0.54	N0.5	N0.5
TETRAHYDROFURAN	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
CYCLOHEXANE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	2.5	N0.5
1,4 DIOXANE	N1.0	N0.5	N0.98	1.2	1.2	0.62	N0.5	1.7	N0.5
BROMODICHLOROMETHANE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
4-METHYL-2-PENTANONE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
2-HEXANONE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
DIBROMOCHLOROMETHANE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
BROMOFORM	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
4-ETHYLTOLUENE	N1.0	0.53	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
ETHANOL	21	10	9.5	5.3	3.5	12	8.1	3.8	11
METHYL TERT-BUTYL ETHER	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
HEPTANE	N1.0	N0.5	N0.98	N0.5	N0.96	N0.5	N0.5	N0.5	N0.5
BROMOCHLOROMETHANE	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-OCTANE	NA	NA	NA	NA	NA	NA	NA	NA	NA

All Sites Carbonyl Duplicates																			
Date Sampled	***9/18/1995***	***9/18/1995***		***12/4/1997***	***12/4/1997***		***3/11/1999***	***3/11/1999***		***3/23/1999***	***3/23/1999***		***8/10/1999***	***8/10/1999***		***8/10/1999***	***8/10/1999***		
Location	***cornwall***	***cornwall***		***Bay St.***	***Bay St.***		***Bay St.***	***Bay St.***		***Bay St.***	***Bay St.***		***Bay St.***	***Bay St.***		***Yew***	***Yew***		
carbonyl lab	ERG	ERG		ERG	ERG		ERG	ERG		ERG	ERG		ERG	ERG		ERG	ERG		
Day of the Week	M	M		TH	TH		Th	Th		Tu	Tu		Tu	Tu		Tu	Tu		
Notes							Dup 1	Dup 2		Dup 1	Dup 2		dup 1	dup 2		Dup1	Dup 2		
sample start time (PST)	0	0		1205	1205		0	0		0	0		0	0		0	0		
sample duration (minutes)	1440	1440		1440	1440		1440	1440		1440	1440		1440	1440		1440	1440		
Notes	**dup 1**	**dup 2**	**RPD**	**dup 1**	**dup 2**	**RPD**	Dup 1	Dup 2	**RPD**	dup 1	dup 2	**RPD**			**RPD**	minimall	minimall	**RPD**	**AVG. rpd**
Units	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv		
FORMALDEHYDE	14.56	12.65	14.04	3.21	2.99	7.10	3.66	3.9	6.35	2.03	2.26	10.72	2.4	3.07	24.50	2.99	3.19	6.47	11.53
ACETALDEHYDE	5.74	4.91	15.59	1.31	1.24	5.49	1.56	1.61	3.15	1.17	1.3	10.53	1.07	1.21	12.28	1.55	1.59	2.55	8.26
ACETONE	1.96	1.40	33.33	2.29	2.07	10.09	3.72	4.02	7.75	2.2	2.5	12.77	0.85	1.52	56.54	1.12	1.15	2.64	20.52
ACROLEIN	0.22	0.18	20.00	0.09	0.07	25.00	ND	ND		ND	ND		0.05	0.02	85.71	ND	ND		43.57
PROPIONALDEHYDE	1.03	0.89	14.58	0.11	0.08	31.58	0.2	0.21	4.88	0.15	0.17	12.50	0.11	0.12	8.70	0.17	0.16	6.06	13.05
CROTONALDEHYDE	0.16	0.13	20.69	ND	ND		0.15	0.16	6.45	ND	ND		0.01	0.01	0.00	ND	ND		9.05
BUTYR/ISOBUTYRALDEHY	0.60	0.52	14.29	0.18	0.20	10.53	0.23	0.24	4.26	0.13	0.15	14.29	0.14	0.21	40.00	0.2	0.21	4.88	14.71
BENZALDEHYDE		0.26		0.13	0.11	16.67	0.1	0.1	0.00	0.05	0.05	0.00	0.08	0.13	47.62	0.11	0.11	0.00	12.86
ISOVALERALDEHYDE	0.14	0.12	15.38	ND	ND		ND	ND		ND	ND		0.02	0.02	0.00	0.03	0.03	0.00	5.13
VALERALDERHYDE (PENT	0.23	0.22	4.44	0.02	0.01	66.67	0.06	0.06	0.00	0.03	0.04	28.57	0.05	0.06	18.18	0.08	0.08	0.00	19.64
TOLUALDEHYDES	0.54	0.40	29.79	0.07	0.06	15.38	0.06	0.06	0.00	0.02	0.03	40.00	0.06	0.08	28.57	0.07	0.08	13.33	21.18
HEXANALDEHYDE	0.22	0.16	31.58	0.04	0.04	0.00	0.04	0.04	0.00	0.05	0.07	33.33	0.05	0.08	46.15	0.07	0.07	0.00	18.51

Date Sampled	***9/18/1995***	***9/18/1995***		***12/11/1995***	***12/11/1995***		***3/28/1996***	***3/28/1996***		***9/12/1996***	***9/12/1996***	
Location	***cornwall***	***cornwall***		***cornwall***	***cornwall***		***cornwall***	***cornwall***		***cornwall***	***cornwall***	
VOC lab	ERG	ERG		ERG	ERG		ERG	ERG		ERG	ERG	
Day of Week	M	M		M	M		TH	TH		TH	TH	
Notes	**dup 1**	**dup 2**		**dup 1**	**dup 2**		**dup 1**	**dup 2**		**dup 1**	**dup 2**	
sample start time (PST)	0	0		0	0		0	0		0	0	
sample duration (minutes)	1440	1440		1440	1440		1440	1440		1440	1440	
Notes			RPD			RPD			RPD			RPD
Units	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%
ACETYLENE	5.40	5.31	1.68	9.03	9.79	8.08	5.27	5.44	3.17	2.17	2.07	4.72
CHLOROMETHANE	0.65	0.51	24.14	0.39	0.50	24.72	0.39	0.50	24.72	0.55	0.46	17.82
VINYL CHLORIDE												
BROMOMETHANE												
CHLOROETHANE												
1,1-DICHLOROETHENE												
METHYLENE CHLORIDE	10.19	13.57	28.45	4.28	4.43	3.44	7.28	6.98	4.21	15.07	14.17	6.16
1,1 - DICHLOROETHANE												
CIS-1,2-DICHLOROETHENE												
CHLOROFORM	0.12	0.12	0.00							0.17	0.17	0.00
1,1,1 - TRICHLOROETHANE	0.48	0.45	6.45							0.39	0.41	5.00
CARBON TETRACHLORIDE										0.07	0.08	13.33
BENZENE	0.73	0.70	4.20	1.11	1.11	0.00	0.51	0.62	19.47	0.71	0.84	16.77
1,2 - DICHLOROETHANE												
TRICHLOROETHYLENE												
1,2 - DICHLOROPROPANE												
cis - 1,3 - DICHLOROPROPENE												
TOLUENE	2.70	2.67	1.12	3.01	3.01	0.00	1.70	1.77	4.03	3.78	3.75	0.86
trans - 1,3 - DICHLOROPROPENE												
1,1,2 - TRICHLOROETHANE												
TETRACHLOROETHYLENE				0.08	0.08	0.00				0.06	0.05	13.95
ETHYLENE DIBROMIDE												
CHLOROBENZENE												
ETHYLBENZENE	0.61	0.60	1.65	0.61	0.58	5.04	0.42	0.42	0.00	0.93	0.89	4.40
m,p - XYLENE	3.28	3.24	1.23	3.19	2.98	6.81	2.27	2.38	4.73	3.65	3.64	0.27
o - XYLENE	1.35	1.34	0.74	1.27	1.17	8.20	0.92	0.95	3.21	1.31	1.29	1.54
STYRENE	0.11	0.11	2.30	0.13	0.12	8.00	0.04	0.05	22.22	1.21	1.00	19.00
1,1,2,2 - TETRACHLOROETHANE	1.00	0.16	144.83									
1,3,5 TRIMETHYLBENZENE												
1,2,4 TRIMETHYLBENZENE												
m -(1,3)- DICHLOROBENZENE												
p -(1,4)- DICHLOROBENZENE												
CHLOROTOLUENE												
o -(1,2)- DICHLOROBENZENE												
1,2,4-TRICHLOROBENZENE												
HEXACHLOROBUTADIENE												
PROPYLENE	1.09	1.07	1.85	1.72	1.64		0.74	0.72	2.74	0.75	0.70	6.90
1,3-BUTADIENE										0.07	0.07	0.00
ACETONE												
CARBON DISULFIDE												
2-PROPANOL												
trans - 1,2 - DICHLOROETHYLENE												
VINYL ACETATE												
CHLOROPRENE												
2-BUTANONE(MEK)												
HEXANE												
TETRAHYDROFURAN												
CYCLOHEXANE												
1,4 DIOXANE												
BROMODICHLOROMETHANE												
4-METHYL-2-PENTANONE												
2-HEXANONE												
DIBROMOCHLOROMETHANE												
BROMOFORM												
4-ETHYLTOLUENE												
ETHANOL												
METHYL TERT-BUTYL ETHER												
HEPTANE												
BROMOCHLOROMETHANE												
N-OCTANE	1.78	1.74	2.27	1.27	1.17	8.20	1.46	1.46	0.00	3.05	3.02	0.99

Date Sampled	***1/27/1999***	***1/27/1999***		***2/14/1999***	***2/14/1999***		***3/1/1999***	***3/1/1999***		***12/13/1998***	***12/13/1998***	
Location	***Bay St.***	***Bay St.***		***Bay St.***	***Bay St.***		***Bay St.***	***Bay St.***		***Yew***	***Yew***	
VOC lab	ATL	ATL		ATL	ATL		ATL	ATL		ATL	ATL	
Day of Week	W	W		SU	SU		M	M		SU	SU	
Notes	**Dup 1**	**Dup 2**		**Dup 1**	**Dup 2**		**Dup 1**	**Dup 2**		**dup 1**	**dup 2**	
sample start time (PST)	0	0		1101	1121		1620	1630		0	0	
sample duration (minutes)	1440	1440		1440	1440		1440	1440		1440	1440	
Notes	Bay Sampler	Yew Sampler	RPD	Targeted Bay Sampler	Targeted 24-hr. mech sampler	RPD	Targeted Bay Sampler	Targeted 24-hr. mech sampler	RPD	Yew Fire Station Yew St. sampler	Yew Fire Station Bay St. sampler	RPD
Units	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%	ppbv	ppbv	%
ACETYLENE	NA	NA		NA	NA		NA	NA		NA	NA	
CHLOROMETHANE	0.69	4.2	143.56	1	1	0.00	0.86	0.83	3.55	N0.1	N0.1	
VINYL CHLORIDE	ND0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
BROMOMETHANE	0.13	0.56	124.64	N0.1	N0.2		N0.1	N0.19		0.29	0.28	3.51
CHLOROETHANE	0.05	0.56	167.21	N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
1,1-DICHLOROETHENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
METHYLENE CHLORIDE	4.4	12	92.68	0.12	0.37	102.04	4	1.5	90.91	N	N	
1,1 - DICHLOROETHANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
CIS-1,2-DICHLOROETHENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
CHLOROFORM	0.05	0.2	120.00	0.45	0.4	11.76	N0.1	N0.19		N0.1	N0.1	
1,1,1 - TRICHLOROETHANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
CARBON TETRACHLORIDE	N0.1	N0.2		N0.1	N0.2		0.16	0.09	56.00	0.11	0.11	0.00
BENZENE	0.52	1.2	79.07	0.92	0.92	0.00	1.4	1.1	24.00	4.9	1.7	96.97
1,2 - DICHLOROETHANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		0.11	0.05	75.00
TRICHLOROETHYLENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		0.05	0.26	135.48
1,2 - DICHLOROPROPANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
cis - 1,3 - DICHLOROPROPENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
TOLUENE	1.2	1.9	45.16	1.8	1.6	11.76	2.8	1.8	43.48	10	3.8	89.86
trans - 1,3 - DICHLOROPROPENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
1,1,2 - TRICHLOROETHANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
TETRACHLOROETHYLENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
ETHYLENE DIBROMIDE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
CHLOROBENZENE	0.12	0.44	114.29	0.05	0.32	145.95	N0.1	N0.19		0.05	4.1	195.18
ETHYLBENZENE	0.22	0.23	4.44	0.21	0.29	32.00	0.26	0.38	37.50	1.2	0.36	107.69
m,p - XYLENE	1.1	0.83	27.98	0.75	0.93	21.43	0.64	0.96	40.00	4.8	1.4	109.68
o - XYLENE	0.48	0.25	63.01	0.29	0.36	21.54	0.2	0.36	57.14	1.4	0.4	111.11
STYRENE	0.14	0.1	33.33	0.11	0.2	58.06	N0.1	N0.19		N0.1	N0.1	
1,1,2,2 - TETRACHLOROETHANE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
1,3,5 TRIMETHYLBENZENE	0.22	0.1	75.00	0.17	0.1	51.85	N0.1	N0.19		0.47	0.05	161.54
1,2,4 TRIMETHYLBENZENE	0.62	0.36	53.06	0.62	0.47	27.52	0.05	0.22	125.93	2	0.39	134.73
m -(1,3)- DICHLOROBENZENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
p -(1,4)- DICHLOROBENZENE	0.39	0.1	118.37	0.33	0.1	106.98	N0.1	N0.19		0.05	0.44	159.18
CHLOROTOLUENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
o -(1,2)- DICHLOROBENZENE	0.44	0.25	55.07	N0.1	N0.2		N0.1	N0.19		0.05	0.49	162.96
1,2,4-TRICHLOROBENZENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
HEXACHLOROBUTADIENE	N0.1	N0.2		N0.1	N0.2		N0.1	N0.19		N0.1	N0.1	
PROPYLENE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.1	
1,3-BUTADIENE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.1	
ACETONE	0.93	66	194.44	1.8	3.2	56.00	2.6	2.9	10.91	2.6	2	26.09
CARBON DISULFIDE	0.25	2.2	159.18	0.52	N0.98		N0.5	N0.96		0.75	0.92	20.36
2-PROPANOL	6.2	24	117.88	2.9	2	36.73	2.2	0.48	128.36	N0.5	N0.5	
trans - 1,2 - DICHLOROETHYLENE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
VINYL ACETATE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
CHLOROPRENE	NA	NA		NA	NA		NA	NA		NA	NA	
2-BUTANONE(MEK)	0.28	4	173.83	0.53	0.48	9.90	0.66	0.48	31.58	0.96	6.2	146.37
HEXANE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		2.7	0.87	102.52
TETRAHYDROFURAN	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
CYCLOHEXANE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
1,4 DIOXANE	7.7	0.5	175.61	N0.5	N0.98		1.2	1.2	0.00	4	0.55	151.65
BROMODICHLOROMETHANE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
4-METHYL-2-PENTANONE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
2-HEXANONE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
DIBROMOCHLOROMETHANE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
BROMOFORM	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
4-ETHYLTOLUENE	0.59	0.5	16.51	0.53	0.48	9.90	N0.5	N0.96		1.5	0.25	142.86
ETHANOL	2.4	21	158.97	10	9.5	5.13	5.3	3.5	40.91	6.7	3	76.29
METHYL TERT-BUTYL ETHER	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		N0.5	N0.5	
HEPTANE	N0.5	N1.0		N0.5	N0.98		N0.5	N0.96		1	0.25	120.00
BROMOCHLOROMETHANE	NA	NA		NA	NA		NA	NA		NA	NA	
N-OCTANE	NA	NA		NA	NA		NA	NA		NA	NA	

Date Sampled	***8/22/1999***	***8/22/1999***		3/9/1999	8/12/1999	3/29/1999	4/16/1999	8/12/1999	9/27/1999	3/10/1999		
Location	***Yew***	***Yew***		Bay St. sampler audit UHP N2	Bay St. sampler audit UHP N2	Bay St. sampler audit UHP N2	Yew St. auto sampler UHP N2 audit	Yew St. auto sampler UHP N2 audit	Yew St. Mech. Sampler UHP N2 audit	Bay St. sampler audit (at nwapa)	cal gas mix (at lab)	
VOC lab	ATL	ATL		ATL	ATL	ATL	ATL	ATL	ATL	ATL	ATL	
Day of Week	SU	SU										
Notes	**dup 1**	**dup 2**										
sample start time (PST)	0	0										
sample duration (minutes)	1440	1440										
Notes	auto valves w/ flow cont.	auto valves w/ flow cont.	RPD	can 2492	can 1013	can 1003	can 81	can 426	can 99	**spiked audit sample can 787**	**spiked audit source can 267**	
Units	ppbv	ppbv	%	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	
ACETYLENE	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	RPD%
CHLOROMETHANE	0.88	1.1	22.22	0.28	0.27	0.79	1.7	0.27	0.29	68	46.653	37.24
VINYL CHLORIDE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	64	49.086	26.38
BROMOMETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	0.35	N0.13	N0.16	60	20.474	98.23
CHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	77	44.015	54.51
1,1-DICHLOROETHENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	49	50.28	2.58
METHYLENE CHLORIDE	N0.16	N0.16		N0.14	0.78	N0.14	0.41	N0.13	0.19	53	48.87	8.11
1,1 - DICHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	57	49.748	13.59
CIS-1,2-DICHLOROETHENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	53	50.071	5.68
CHLOROFORM	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	61	51.542	16.81
1,1,1 - TRICHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	60	54.944	8.80
CARBON TETRACHLORIDE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	64	54.582	15.88
BENZENE	0.56	0.75	29.01	N0.14	0.33	N0.14	0.77J	N0.13	N0.16	55	51.072	7.41
1,2 - DICHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	62	52.053	17.44
TRICHLOROETHYLENE	N0.16	N0.16		N0.14	N0.12	N0.14	0.28	N0.13	N0.16	58	53.454	8.16
1,2 - DICHLOROPROPANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	57	51.994	9.19
cis - 1,3 - DICHLOROPROPENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	N0.37	NA	
TOLUENE	0.67	2.2	106.62	N0.14	0.63	N0.14	0.36	N0.13	N0.16	56	50.934	9.48
trans - 1,3 - DICHLOROPROPENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	N0.37	NA	
1,1,2 - TRICHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	51	53.337	4.48
TETRACHLOROETHYLENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	56	53.668	4.25
ETHYLENE DIBROMIDE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	54	53.885	0.21
CHLOROBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	53	53.084	0.16
ETHYLBENZENE	0.08	0.23	96.77	N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	52	52.257	0.49
m,p - XYLENE	0.08	0.84	165.22	N0.14	0.24	N0.14	0.24J	N0.13	N0.16	100	104.04	3.96
o - XYLENE	0.08	0.29	113.51	N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	49	51.803	5.56
STYRENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	N0.37	NA	
1,1,2,2 - TETRACHLOROETHANE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	46	51.567	11.41
1,3,5 TRIMETHYLBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	46	46.026	0.06
1,2,4 TRIMETHYLBENZENE	0.08	0.19	81.48	N0.14	N0.12	N0.14	0.27	N0.13	N0.16	45	47.831	6.10
m -(1,3)- DICHLOROBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	42	49.623	16.64
p -(1,4)- DICHLOROBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	41	49.657	19.10
CHLOROTOLUENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	N0.37	NA	
o -(1,2)- DICHLOROBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	41	48.951	17.68
1,2,4-TRICHLOROBENZENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	22	38.238	53.91
HEXACHLOROBUTADIENE	N0.16	N0.16		N0.14	N0.12	N0.14	N0.24	N0.13	N0.16	35	49.396	34.12
PROPYLENE	0.41	0.79	63.33	N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
1,3-BUTADIENE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
ACETONE	4.8	3	46.15	5.9	1.4	0.91	23	0.92	1.3	4.5	NA	
CARBON DISULFIDE	1.2	1.5	22.22	N0.72	0.81	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
2-PROPANOL	2.3	0.395	141.37	N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
trans - 1,2 - DICHLOROETHYLENE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
VINYL ACETATE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
CHLOROPRENE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
2-BUTANONE(MEK)	1.4	0.88	45.61	N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
HEXANE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
TETRAHYDROFURAN	0.41	0.82	66.67	N0.72	0.81B	0.86B	N1.2	N0.66	1.0B	N1.9	NA	
CYCLOHEXANE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
1,4 DIOXANE	5.8	1.6	113.51	8.3	N0.59	N0.72	1.3	1.3	N0.81	N1.9	NA	
BROMODICHLOROMETHANE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
4-METHYL-2-PENTANONE	0.96	0.395	83.39	N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
2-HEXANONE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
DIBROMOCHLOROMETHANE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
BROMOFORM	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
4-ETHYLTOLUENE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
ETHANOL	7.3	6.4	13.14	2.1	1.7	1.9	13	4.1	N0.81	2.3	NA	
METHYL TERT-BUTYL ETHER	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
HEPTANE	N0.82	N0.79		N0.72	N0.59	N0.72	N1.2	N0.66	N0.81	N1.9	NA	
BROMOCHLOROMETHANE	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	
N-OCTANE	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	

Chemicals Typically Below Detection Limits					
	Frequency above detection limits (percent)				
	Cornwall	Railroad	Grab	Bay	Yew
1,1 - DICHLOROETHANE	0	0	0	0	6.67
1,1,1 - TRICHLOROETHANE			0	12	0
1,1,2 - TRICHLOROETHANE	0	0	0	0	0
1,1,2,2 - TETRACHLOROETHANE	3.23	0	0	3	0
1,1-DICHLOROETHENE		0	0	0	0
1,2 - DICHLOROETHANE	0	0	0	0	6.67
1,2 - DICHLOROPROPANE	0	0	0	0	0
1,2,4-TRICHLOROBENZENE	nm	0	0	15	6.67
1,3-BUTADIENE	19.35	14	0	0	0
2-HEXANONE	nm	0	0	3	0
4-ETHYLTOLUENE	nm		0		
4-METHYL-2-PENTANONE	nm	0	0	0	6.67
2-PROPANOL	nm				13.33
BROMOCHLOROMETHANE	0	nm	nm	nm	nm
BROMODICHLOROMETHANE	0	0	0	0	0
BROMOFORM	0	0	0	0	0
BROMOMETHANE	0	0	0		20
CARBON TETRACHLORIDE			0		13.33
CHLOROBENZENE	3.23	0	0	9	6.67
CHLOROETHANE	0	0	0	3	0
CHLOROFORM					13.33
CHLOROPRENE	0	0	0	0	
CHLOROTOLUENE	nm	0	0	0	6.67
cis - 1,3 - DICHLOROPROPENE	0	0	0		0
CIS-1,2-DICHLOROETHENE	nm	14	0	0	0
CROTONALDEHYDE		0	nm		20
CYCLOHEXANE	nm	0	0	9	0
DIBROMOCHLOROMETHANE	0	0	0	0	0
ETHYLENE DIBROMIDE	nm	0	0	0	0
HEPTANE	nm		0	6	20
HEXACHLOROBUTADIENE	nm	0	0	6	0
m -(1,3)- DICHLOROBENZENE	3.23	0	0	3	0
METHYL TERT-BUTYL ETHER	nm	0	0	0	0
o -(1,2)- DICHLOROBENZENE	0	0	0	12	6.67
p -(1,4)- DICHLOROBENZENE	3.23	0			
PROPYLENE		14	0	0	6.67
STYRENE			0	6	6.67
TETRACHLOROETHYLENE			0	21	0
TETRAHYDROFURAN	nm	14	0	3	13.33
trans - 1,2 - DICHLOROETHYLENE	0	0	0	0	0
trans - 1,3 - DICHLOROPROPENE	0	0	0	0	0
TRICHLOROETHYLENE	6.45	0	0	0	13.33
VINYL ACETATE	nm	0	0	0	0
VINYL CHLORIDE	0	0	0	0	0

Nm=not measured

1996 Hazardous Air Pollutant Emissions in Pounds

Pollutant - Pounds in 1996	Non-Point Sources (Whatcom County)		Point Sources (within Bellingham city limits)						
	Area	Mobile	Georgia Pacific	GN Plywood, Inc.	Post Point WWTP	Brooks Mfg. Co.	Oeser Cedar	WWU	Encogen
Formaldehyde	1957	207173	5174	72		22	10	31	2062
Acetaldehyde	162	90014	29390	33		9	4		
Acrolein	1701	15807	110						
Methylene Chloride	46302		166						
Chloroform	641		230002		5				
Carbon Tetrachloride	88		805						
Benzene	7611	526153	193		1	11	5	5	
p-(1,4)-Dichlorobenzene	12637								
Carbon Disulfide	370		290						
1,4 Dioxane (1,4-Diethylene Dioxide)	3								
Tetrachloroethylene	23200		166						

Area Sources

Animal Cremation
Asphalt Concrete Manufacturing
Autobody Refinishing Paint Application
Aviation Gasoline Distribution: Stage I & II
Boat Manufacturing
Consumer Products Usage
Dental Preparation and Use
Dry Cleaning (Petroleum Solvent)
Fluorescent Lamp Recycling
Gasoline Distribution Stage I & II
General Laboratory Activities
Halogenated Solvent Cleaners
Hospital Sterilizers
Human Cremation
Institutional/Commercial Heating
Residential Heating
Lamp Breakage
Miscellaneous Organic Chemical Processes
Natural Gas Transmissions and Storage
Oil and Natural Gas Production
Paint Stripping Operations
Perchloroethylene Dry Cleaning
Pesticide Application
Steel Pickling HCl Process
Structure Fires
Surface Coatings
Wood Products, Nec

Point Sources

Sources within the jurisdiction of the Authority that have the potential to emit greater than 50 tons per year of a criteria pollutant.

Mobile Sources

All Aircraft Types and Operations
All Off-highway Vehicle: Diesel
All Off-highway Vehicle: Gasoline, 2-Stroke
All Off-highway Vehicle: Gasoline, 4-Stroke
Heavy Duty Diesel Vehicles (HDDV)
Heavy Duty Gasoline Vehicles (HDGV)
Light Duty Diesel Trucks (LDDT)
Light Duty Diesel Vehicles (LDDV)
Light Duty Gasoline Trucks 1 & 2 (LDGT)
Light Duty Gasoline Vehicles (LDGV)
Marine Vessels, Commercial
Motorcycles (MC)
Railroads-Diesel

Summary

The emission figures in the table listed above came from a variety of sources. Area and mobile source emissions were calculated by the EPA on a county-wide basis. These numbers include emissions for all of Whatcom county in 1996. The emissions from open burning and wildfires were not included in the table due to the low occurrence of these activities within the city limits. The EPA estimated emissions based on several parameters including population figures, assummed activity levels and emission factors. These figures have not undergone extensive review by NWAPA staff.

Point source emissions are either submitted to NWAPA by the source or calculated by NWAPA staff based on throughput information submitted by the source. Only point sources within the city limits of Bellingham were included in this table. The point source information was reviewed extensively by NWAPA staff.